

PUBLIC Works

City, County and State

December, 1961



Raymond J. Faust, Executive Secretary of the American Water Works Association, and AWWA's publications display are exemplary of what the association is doing for the water works industry and those who are engaged in it. Adequate water of top quality is the goal and current theme. More details on page 18.

NEW JOHN DEERE 2010



It takes a big schedule to keep this one busy!

Extra power does make a difference—and the “2010” has it! Fifty engine horsepower pays benefits on jobs from trenching and loading to landscaping—provides fast moves from job to job. Power steering boosts performance at the gravel pit and on busy city streets. Low-profile design adds stability to improve backhoe work, speed excavating, material handling jobs.

Constant-mesh transmission provides eight speeds forward, three reverse, to handle the wide variety of power-matched equipment offered.

Center-mounted and offset-digging backhoes operate with two-lever con-

trol. Heavy-duty loader has single operating lever for lift arms and bucket, which is self-leveling. Landscape equipment includes rear blades, scarifier-scraper, rake, and combination fertilizer-seeder. Sideboom with hydraulic counterweights is also available for gas, water, and other utility construction work.

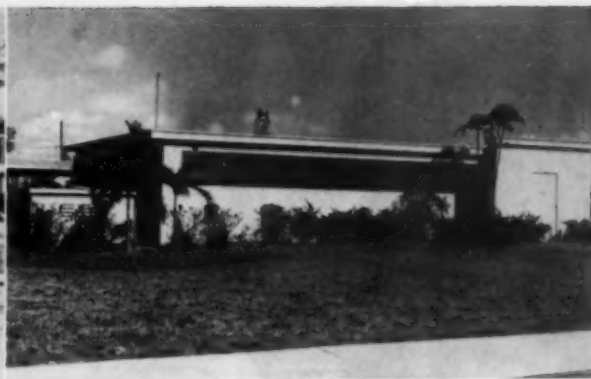
For detailed specifications on new John Deere “2010” Wheel Loaders and equipment, and a demonstration on your job, contact your John Deere dealer through the classified telephone directory. John Deere, 3300 River Drive, Moline, Illinois.



**LOADERS
BACKHOES
BULLDOZERS
AND
EARTHMOVING
EQUIPMENT**



Swing Diffuser® Aeration Equipment with SHEARFUSER Diffusers provide clog-proof, highest oxygenation and circulation at lowest air pumpage and power use. Bulletin 175A.

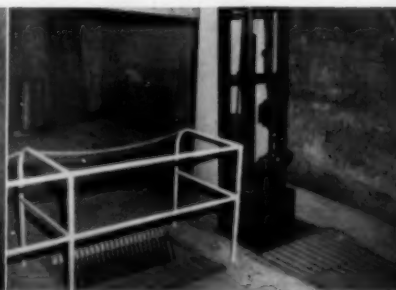


RatedAeration® Small Unit Sewage Treatment Process Equipment for 20 to 5,000 people . . . odor free, nuisance free, low cost. More than 1,100 installations. Bulletin 135A.

"from Chicago" Modern Equipment



Flush Kleen® Sewage Pumps with Flo Thru Strainers never clog! Solids never reach the impeller. More than 12,000 installations. Bulletin 122D.

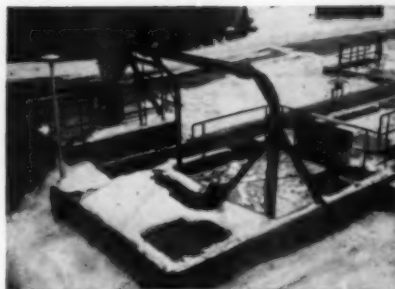


Model "C" Barminutor® provides continuous reversible cutting, automatic screening and comminuting without removal from flow . . . requires less power.

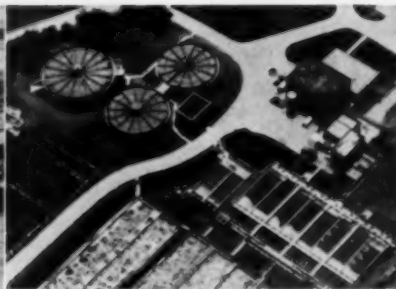


Scrui Flo® Sludge Pump—Positive displacement clog proof sludge pump for pumping sludge from 75 GPM to 400 GPM . . . heads to 120'. Bulletin 191.

for Modern Sewage Processes



AER-DEGRITTER® Aerated Grit Removal System with controlled circulation provides simultaneous grit washing, transportation and concentration.



CRP® The Accelerated Sludge Digestion System for increased performance and unparalleled savings. Over 70 systems in successful operation. Bulletin 145.

Chicago Pump offers a complete line of Sewage Treatment Equipment capable of solving any sewage problem.

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- STANDARDIAIRE® Blowers
- "CHICAGO" Pontoon Covers
- COMMUNITOR
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HYDRODYNAMICS DIVISION
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Wet grounds couldn't stop this double play

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ROUND RUBBER GASKET

Engineers: Black & Veatch
Contractor: Torsen Construction Co.

A-M REINFORCED CONCRETE PIPE with CONCRETE and ROUND RUBBER JOINTS

The problem:

Installation of 8,000 ft. of concrete sewer pipe running parallel to a creek and below its water level. The problem was complicated by numerous springs and unstable ground conditions so serious as to allow opening the trench for only one or two lengths of pipe at a time.

The solution:

Long lengths of A-M's 60" C. & R. R.* pipe reduced the total number of necessary joints. Quick, easy fitting of the joints cut installation time in spite of the problem of poor ground conditions. Tight joints far exceeded the maximum infiltration requirement for this Johnson County, Kansas project.

Write our technical staff for help in solving your problem.

*American-Marietta's Concrete And Round Rubber Joint.

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CONCRETE PRODUCTS DIVISION

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THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

DECEMBER, 1961 • Volume 92, Number 12

Bold Program Rebuilds Downtown Street	73	Treating Combined Sewage and Poultry Wastes	98
<i>How cooperation of merchants, utilities, city and state launched a major street rebuilding program in downtown Loganport.</i> J. T. RINEHART		<i>Waste flows from poultry processing plants in Gainesville, Ga., about doubled in a short time, leading to unusual problems.</i> GEORGE WHITEN	
From Six Outfalls to One Treatment Plant	75	Coatings for Protecting Water Tanks	100
<i>A modernized sewerage system necessitated modification of a combined sewer system to provide a common outfall.</i> BRUCE B. WATTS		<i>Details of recently developed paint systems for water tank protection.</i> C. A. BRUCKMAN	
Flooding Reduced by Lowering a Dam	78	Snow and Ice Control—A Full-Time Engineering Job ..	102
<i>By lowering a dam 432 feet and providing erosion protection on downstream reaches, a serious flooding problem was solved.</i> A. R. PAGAN		<i>How winter maintenance of Massachusetts highways is improved by full-time engineering study and direction.</i> ROBERT E. LEE	
Water Demand Meters Show Results	81	King-Sized Marina is a Federal-County Project	104
<i>Meters built to meet Milwaukee's specific needs produce records on which demand charges are based.</i> ROBIN E. MIDDLEMAS		33-Year-Old Force Main Shows Increased Strength	105
Report on Experience with Median Barriers	85	Expansion Triples Water Plant Capacity	106
<i>A comparison of costs and effectiveness of two types of median barriers which have been installed on California freeways.</i> G. M. WEBB and W. E. SCHAEFER		<i>Unusually large addition to the Squaw Peak Filtration Plant adds 60 mgd to the Phoenix water supply.</i> ART F. VONDRICK	
Pavement Heating Experiment	88	Six Years of Refuse Composting in Britain	110
Small Filter Plant Treats Hudson River Water	89	<i>A review of British experience in domestic refuse composting.</i> J. GRINDROD	
<i>Compact, automated plant gives effective treatment to this surface water supply.</i>		Modern Street Cleaning	125
No Delay on This Detour	91	<i>Details of operating procedures used by the City of Cincinnati.</i> CARL V. GAILEY	
<i>Construction details on the successful stabilization and quick utilization of a critical detour route.</i> WILLIAM J. GOGGINS		Diesel Engine Starting in Cold Weather	126
Significance of Detergents in Water Pollution Control ..	93	<i>Here are the rules to follow.</i> HERBERT ORWIG	
<i>A summary of recent information on the role of detergents in the pollution of water supply sources.</i> O. JOHN SCHMIDT		Largest Factory-Built Sewage Pumping Station	146
Maintenance of Freeways in Detroit	96	The Disposal of Dead Marine Mammals	151
<i>Maintenance of urban freeways is a specialized operation which requires close cooperation of police, city and county forces to assure a safe, efficient operation.</i> OTTO P. POMMERENING		<i>What to do about that stranded whale.</i> JOE CREISLER	
		How to Roll Out a Carpet of Grass	151
		PUBLIC WORKS DIGEST	
		Highways and Airports	118
		Sewerage and Refuse	132
		Water Works	140
		Industrial Wastes	148

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DEPARTMENTS AND SECTIONS

The Editor's Page	7	APWA News Bulletins	113
About Our Cover	18	Municipal Power	128
Books in Brief	20	News of Engineers	146
Reviews of Catalogs	34	New Equipment	162
Legal Notes	54	Films in Brief	168
Ed Cleary Comments	60	Letter to the Editor	169
Engineering Notes	64	Worth Telling	172



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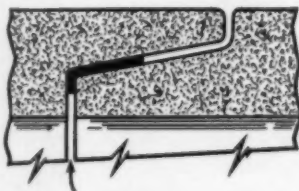
TYLOX[®] flexible GASKET

**for any type of concrete
pipe sewer line
you plan or build**

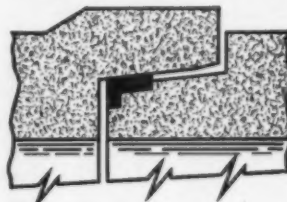


Are your files up to date on the *full line* of Hamilton Kent TYLOX Gaskets? Whether you are planning lines using T & G, B & S, Offset or Recessed Pipe, there's a special TYLOX true compression Gasket, in either rubber or neoprene, to assure fast pipe-laying and make the joints water-tight and acid-resistant for the life of the pipe itself. Check this list, and write for the TYLOX Data Brochures needed to make your reference files complete:

TYPE "C" and "C-P" TYLOX for Straight and Offset Pipe

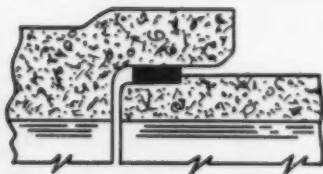


Type "C" Tylox under full compression. Note the visual inspection feature.



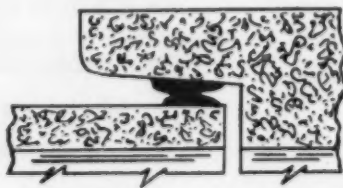
Type "C-P" Tylox under full compression. Flanges "lock" Gasket in proper position on the pipe offset.

TYPE "CR" TYLOX For Offset Pipe



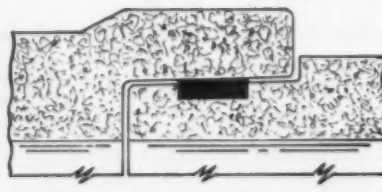
Type "CR" Tylox under full compression on single offset pipe.

TYPE "K" REXON for all types of B & S Pipe



Rexon "K" under full compression. Types available for both heavy and light duty service.

TYPE "CR" TYLOX (for Recessed Pipe)



Tylox Type "CR" under full compression. Wide, flat design makes "CR" roll and twist-proof.

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The Battle of the Winter Budget

THAT GRAY December sky promises some challenging battles to the street and highway maintenance departments of our northern regions. Unfortunately, the responsible engineers and officials often find that more energy and concern are required for battling against a limited and inadequate budget than toward preparation for the winter storms. No budgetary need is more difficult to predict accurately. A budget based on the average of past years' costs may prove alternately extravagant and inadequate as the seasonal moods change. Yet we are not so naive as to suggest unlimited funding of winter maintenance operations.

There is no pat solution to this recurring problem. Every department must somehow make its own peace with the dollar sign. We can suggest only that the final determination give full recognition to the cost of not doing a prompt and proper job of maintaining our streets and highways in an open, safe condition throughout the winter. The question may well be one of how much you can *save* by winter maintenance.

Progress in Water Pollution Control

IT IS UNUSUAL for any association to have as successive presidents such able men as Ray Lawrence and Harry Schlenz, presidents for 1961 and 1962 of the Water Pollution Control Federation. This happy event could not come at a more fortunate time for there is a tremendous job to be done in educating the public, strengthening public health engineering staffs and stressing the development, acceptance and application of better methods of waste treatment. We congratulate the WPCF on its wisdom and good fortune.

Engineers and Non-Engineering Work

A COMMON complaint by many engineers is that they are not utilized fully as engineers and that a part, usually too much, of their time is spent in work not requiring engineers skills. Apart from the fact that someone has to do this non-engineering work, and it is not always possible, especially in a small organization, for the engineer to be relieved of all non-technical details, we do not

believe that this is anything to cry about. Confining work to a single narrow phase of activity does not make for advancement in any organization. Advancement to managerial positions with pleasing salary increases does not come to the narrow specialist but to the man who has used his invaluable engineering training as a base from which to develop useful and salable skills, including a broad knowledge of the workings of the organization to which he belongs.

Desalinization Is Not the Whole Answer

SO MUCH water-happy publicity is being given to desalinization—mainly getting potable water from the sea—that an increasing number of folks may be beginning to believe that water shortages will soon be a thing of the past. This isn't so; it will probably never be possible to recapture economically enough water from the ocean to supply any considerable part of our needs, even for the cities right on the seacoast. Research into and development of methods for converting salt and brackish water into potable water should be continued and even intensified; but the people doing this ought to be careful not to foster and further the impression that desalinization will solve all our water need problems. We will still need wells, dams, reservoirs, pipe lines, treatment plants and a lot of other prosaic components of water works systems.

Waterborne Disease and the Well Known Eternal Vigilance

THE ANNUAL reports of the number of cases of illness resulting from impure water are reassuringly small and indicate that our water works personnel generally have excellent control over water quality. These favorable results, however, should not cloud the fact that eternal vigilance is the price of safety. In a very large number of places, the continuous application of chlorine is the safeguard that must be relied on as the last line of defense. Other treatment methods help; a protected supply also helps; but chlorine, applied by reliable machines preferably in duplicate, in adequate amounts over 24 hours each day is the final payoff. It is the prime job of the waterworks manager to ensure that this is done.



Rugged, every inch of the way

Cast iron pipe was made for tough jobs such as sewage disposal. It resists attack by sewage and sewage gases that require expensive linings in other types of pipe; it keeps sewage flowing smoothly.

Cast iron pipe performs a tough job. It stands up to external and internal loads, shocks and pressures. Bottle-tight joints *eliminate* seepage and infiltration at the most vulnerable points of your system.

Cast iron pipe is rugged every inch of the way . . . and will remain so for over a century.

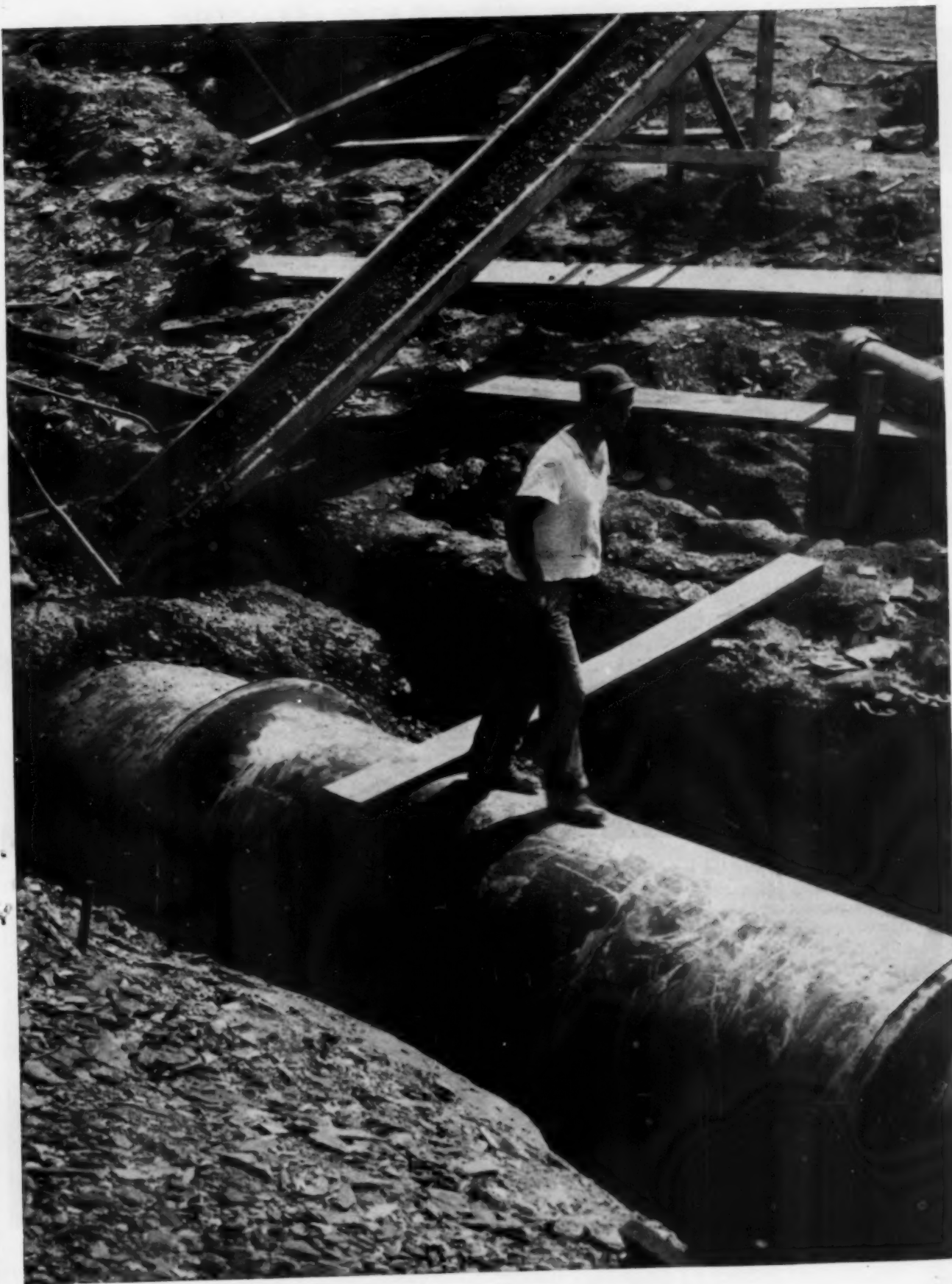


CAST IRON PIPE

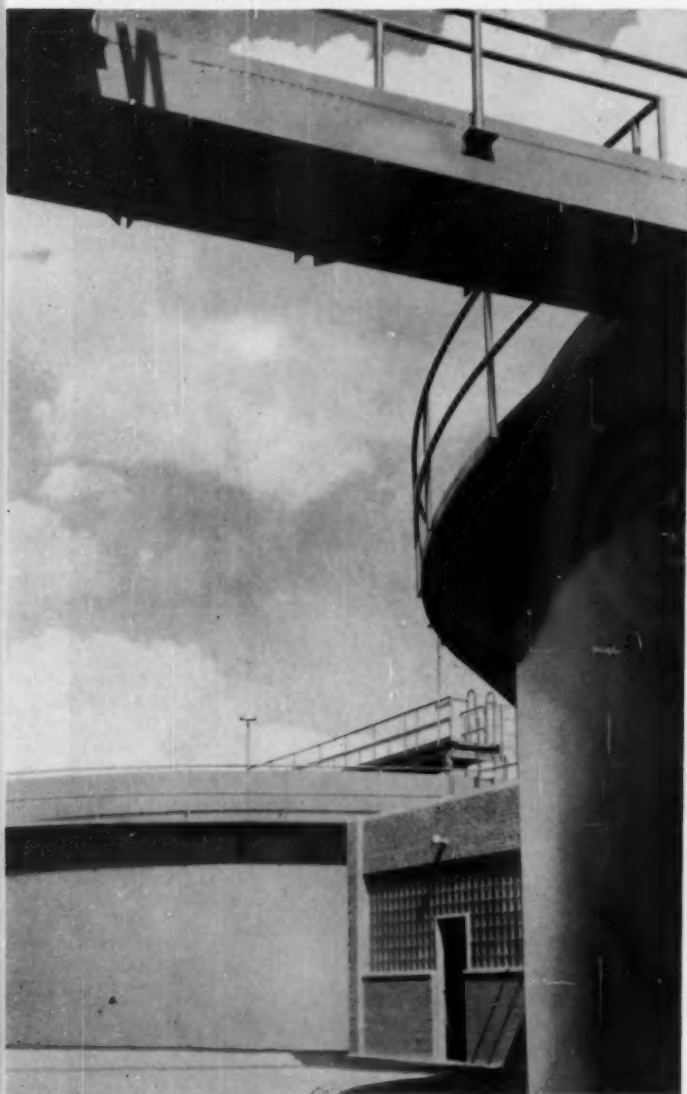
THE MARK OF PIPE THAT LASTS OVER 100 YEARS

CAST IRON PIPE RESEARCH ASSOCIATION

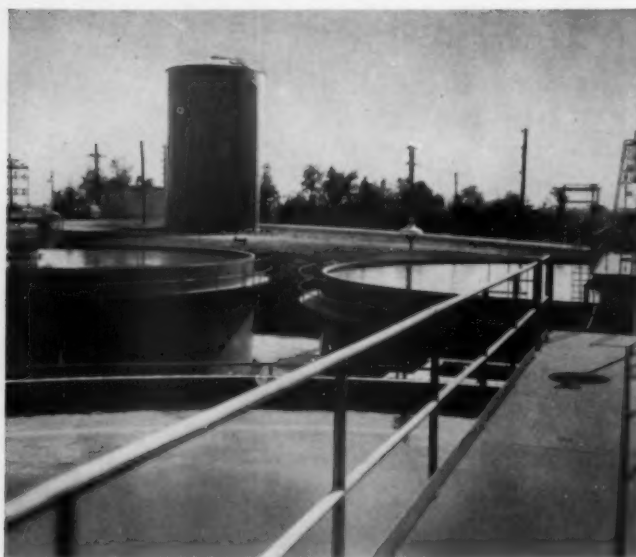
Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Illinois



Two of four purification units at Lexington, Kentucky—each 69' 8" dia x 17' 9" high
—for American Water Works Service Co.



CRAFTSMANSHIP AND PERFORMANCE IN STEEL WATER PURIFICATION AND FILTRATION FACILITIES BY PITTSBURGH- DES MOINES



Lexington, Kentucky installation with 200,000 gallon standpipe,
28' dia x 45' high

The projects pictured typify the long experience of PDM in serving dependably the waterworks field. The same care and skill in construction that have made PDM elevated steel tanks, standpipes and reservoirs the standard of value and performance wherever water is stored, apply equally to the long-lived steel structures PDM builds for modern water filtration and purification. • When water handling is your problem, you'll find the best solution begins with a call to Pittsburgh-Des Moines!

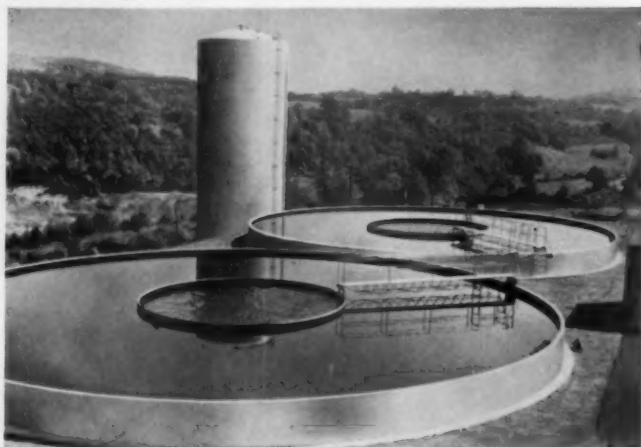


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provide economical operation in:

- Water Filtration Plants • Sewage Treatment Plants • Pumping Stations
- Power Plants • Industrial Plants • Drainage Projects • Flood Control Projects



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Specifically designed to reduce wear caused by repeated opening and closing in such applications as pump suction and discharge lines. Heavily constructed, all working parts are made of high strength materials, assuring dependable, maintenance-free operation.

Three styles available: Swing type • Swing type with Lever and Weight • Swing type with Lever and Spring.

Specifications: Iron body, fully bronze mounted • Bronze seat ring • Bronze disc ring or rubber faced disc • Flanged, screwed or hub ends • 175 p.s.i. working pressure • 350 p.s.i. test pressure • Sizes 2½" through 12" • Waterworks Check Valves also available in sizes 14" through 24" with Hub or Flanged ends.



FLAP VALVES

For use where automatic flow control is required in one direction only and to the atmosphere such as drains through river levees to prevent backflow.

Specifications: Iron body, fully bronze mounted • Bronze seat ring, disc ring and hinge pin • Flanged, hub or spigot frame • Sizes 4" through 24".



SHEAR GATES

Where manual flow control to the atmosphere in either direction is required, shear gates provide dependable operation. Full gate opening with no obstruction of the orifice is assured by the Mueller design. Slight closing wedge-action gives positive seal.

Specifications: Iron body, fully bronze mounted • Bronze seat ring, disc ring and hinge pin • Flanged, hub or spigot frame • Sizes 4" through 24" • Furnished with lift handle and catch.



MUD VALVES

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Give Your Engine Longer Life
Save Gas, Add Safety



1 EXTRA PROTECTION for your crews with this **NEW SAFETY STOP SWITCH** that stops all moving parts of the chipper within seconds. Switch is within easy reach at rear so operator can flip it without moving from feed position. An important new feature of the Fitchburg Chipper, *already considered safest* because it has no hard-to-control flywheel.

2 GREATER ECONOMY with this **NEW SOLENOID SWITCH*** which allows the operator to quickly idle the motor between actual brush feedings. With the motor idling, you save on gasoline and engine wear; and there's less noise, which pleases the public. Your operator can use the switch easily because it is at the rear and handy.

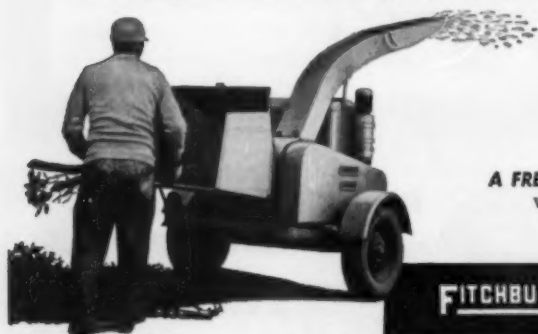
CHIPPING IS SMOOTHER and faster with a Fitchburg because of its exclusive *spring activated*

feed plate. This patented feed plate "gives" automatically under pressure. You can chip even large limbs (up to rated capacity) without killing the engine. And your crews are safer because the feeding action is more positive, smoother, with less whipping of the brush.

CHIPPING IS MORE EFFICIENT with a Fitchburg. The exclusive feed plate allows wood to be chewed up in small bites. This takes less power, and the engine can be run at lower r.p.m.—which is more efficient, saves you gas and cuts engine wear.

TROUBLE-FREE Fitchburg Chippers stay out of your shop so you don't lose valuable man-hours. These rugged machines are the choice of tree surgeons, line clearance contractors and others—men who depend on Chippers day after day to make money. Blades are made from special alloy steel to hold a keen edge for a long time, even with hard use. Fitchburg Chippers are well-engineered, come in four sizes to meet your needs: the largest handle limbs as thick as seven inches with ease.

A **FREE BOOK** "Chip Dollars" should be in your hands if you deal with brush disposal. 20-pages. Write for free copy — Dept. PW-112.



*optional equipment

FITCHBURG ENGINEERING CORPORATION FITCHBURG, MASS.

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1816 Montreal, Quebec
1819 Philadelphia, Pennsylvania
1824 New York, New York
1826 Winchester, Virginia
1827 Wilmington, Delaware
1829 Columbia, Pennsylvania
1830 Detroit, Michigan
1830 Lynchburg, Virginia
1830 Mobile, Alabama
1830 Richmond, Virginia
1831 Baltimore, Maryland
1831 St. Louis, Missouri
1832 Nashville, Tennessee
1834 Pottsville, Pennsylvania
1834 Reading, Pennsylvania
1834 Wheeling, West Virginia
1835 Lancaster, Pennsylvania
1836 Huntsville, Alabama
1840 York, Pennsylvania
1842 Winston-Salem, N. C.
1844 Frederick, Maryland
1844 St. John, New Brunswick

Prior to
1845 Troy, New York
1845 Zanesville, Ohio
1846 Halifax, Nova Scotia
1847 Boston, Massachusetts
1847 Mount Holly, New Jersey
1849 Hartford, Connecticut
1849 Ulica, New York
1850 Honolulu, Hawaii

Prior to
1850 Pittsburgh, Pennsylvania
1851 Albany, New York
1851 Alexandria, Virginia
1852 Buffalo, New York
1853 Chicago, Illinois
1852 Syracuse, New York
1854 Nashua, New Hampshire
1854 Newburgh, New York
1854 Northampton, Pa.

Prior to
1854 Sacramento, California

Prior to
1855 Cambridge, Massachusetts
1855 Minersville, Pennsylvania
1855 Williamsport, Pa.
1856 Cleveland, Ohio
1856 Petersburg, Virginia
1858 Washington, D. C.
1859 San Francisco, California

GAS UTILITIES

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1823 Boston, Massachusetts
1830 Fredericksburg, Virginia
1832 Mobile, Alabama
1835 New Orleans, Louisiana
1835 Philadelphia, Pennsylvania
1838 Charleston, S. Carolina
1839 Louisville, Kentucky
1842 Toronto, Ontario
1845 Cincinnati, Ohio
1845 Painesville, Ohio
1846 Newark, New Jersey
1847 New Haven, Connecticut
1847 Fall River, Massachusetts
1847 Quebec, Quebec
1848 Savannah, Georgia
1849 Hartford, Connecticut

Prior to
1849 Montreal, Quebec
1850 Salem, Massachusetts
1851 Bridgeport, Connecticut
1851 Chicago, Illinois
1851 Indianapolis, Indiana
1851 Madison, Indiana
1851 New Brunswick, N. J.
1851 Richmond, Virginia
1852 Bangor, Maine
1852 Bound Brook, New Jersey

1852 Frederick, Maryland
1852 Norristown, Pennsylvania
1852 Providence, Rhode Island
1852 West Chester, Pa.
1853 Detroit, Michigan
1853 Elizabeth, New Jersey
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1853 Plymouth, Massachusetts
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1855 Ottawa, Ontario
1855 Sandusky, Ohio
1856 Adrian, Michigan
1856 Catasauque, Pennsylvania
1856 Chambersburg, Pa.
1856 Media, Pennsylvania
1857 Allen, Illinois

Prior to
1857 Carlisle, Pennsylvania
1857 Charlottesville, Virginia

Prior to
1857 Harrisburg, Pennsylvania
1857 Huntingdon, Pennsylvania
1857 Lambertville, New Jersey

Prior to
1857 New York, New York

Prior to
1857 Poughkeepsie, New York
1858 Natchez, Mississippi
1858 Raleigh, North Carolina

Prior to
1858 Vicksburg, Mississippi

Prior to
1858 Washington, D. C.
1859 Hannibal, Missouri

Prior to
1859 Lewisburg, Pennsylvania



No substitute pipe has ever matched this record of long-lived,
trouble-free service. Keep this in mind when
you select pipe for your water mains or gas lines.

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WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Everybody talks about ending
water pollution . . .

The Trickling Filter Floor Institute does something about it!



The Institute is an organization of seven leading manufacturers of trickling filter floor blocks dedicated to furthering research, development and improvement of vitrified clay underdrains for Trickling Filters. It is making an important contribution to the country's Clean Waters program.

Engineers studying the different types of treatment for industrial wastes and domestic sewage can find help in the results of this research and development available from any of the members. This help includes—if you do not already have a copy—the TFFI Handbook containing valuable design and operational data and the latest ASTM Specifications C 159-59T.

WHY TRICKLING FILTERS?

That more trickling filters have been built in the past fifteen years than all other types of treatment plants is no accident. Sound reasons for this trend lie in the fact that the trickling filter combines durability with flexibility, low initial cost with low operating cost. In addition, those filters built thirty and more years ago are serving well today. With them, too, you can guard against the continuous or unforeseen major remodelings common to some other types. Trickling filters are easily added to when community or industry growth demand expansion.

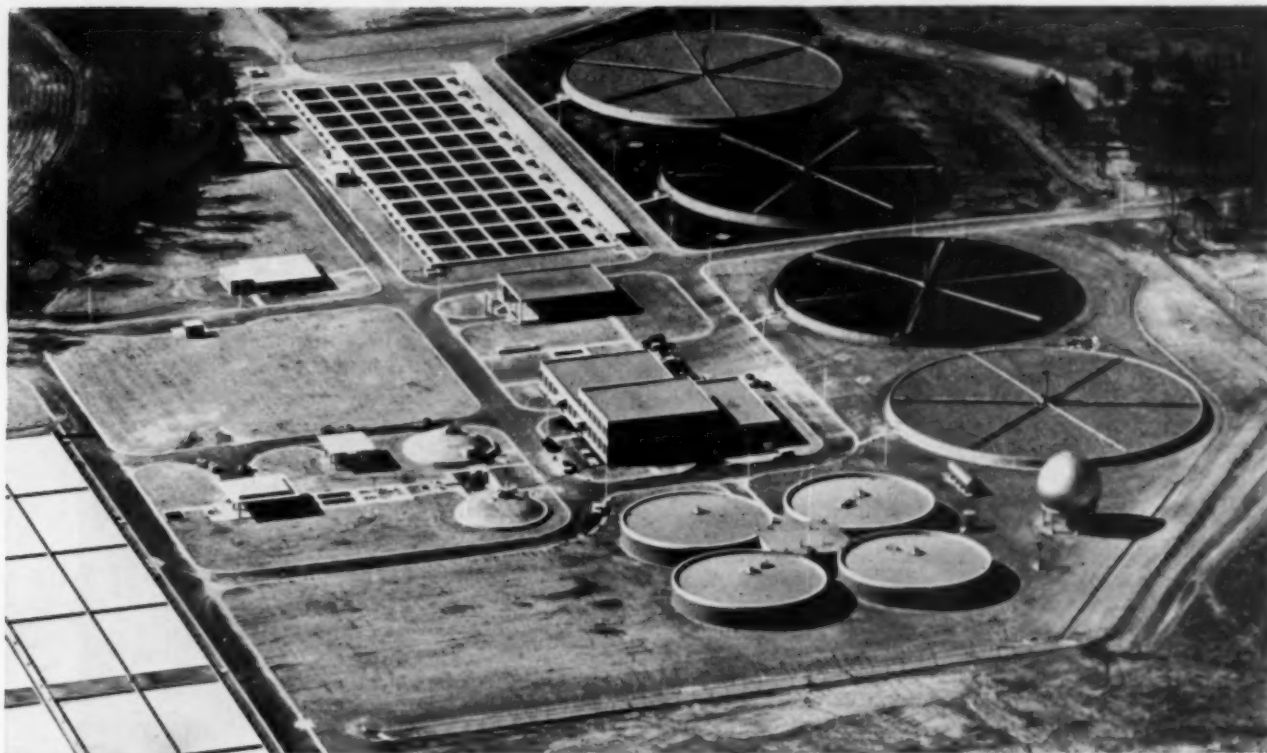
Many of these advantages are based on their employment of enduring vitrified clay floor blocks in the underdrains.

WITH VITRIFIED CLAY UNDERDRAINS

TFFI Specification vitrified clay underdrain blocks are the best assurance against future trouble in a location where trouble can be *big* trouble. (Tearing out a "substitute" filter floor that has failed is no fun and less economy). Then any "savings" gained by use of substitute materials are more than lost. Experience has shown conclusively that vitrified clay is the one material with the longest record of freedom from failure under the corrosive effects of acids, alkalis and bacteriological action.

This alone argues against any experiments with failure-prone substitutes at merely a lower first cost. This is why the TFFI blocks are now going into 90% of the filter floors compared with 15% some thirteen years ago.

This modern sewage treatment plant at Winston-Salem, N. C., has TFFI specification vitrified clay floor blocks in its four 200-foot Trickling Filters. Consulting Engineers, Platt & Davis, Durham, N. C. General Contractor, Lee Construction Co., Charlotte, N. C. Photo, courtesy of A. M. Byers Co., Pittsburgh.



FIRST COST OR TRUE COST?

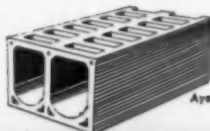
The only true cost is the final one. Clay outlasts all other materials in filter floors so it under-costs them in the long run. This time-tested proven fact outweighs any temporary savings which might follow resort to use of less durable materials for the under-drains.

50-YEAR GUARANTEE

Because their vitrified clay floor blocks are made in modern plants under manufacturing controls of quality impossible with substitute materials, TFFI members offer a 50-Year Guarantee of their blocks.

Demand CERTIFIED Underdrain Blocks

Vitrified clay block manufactured by TFFI members and tested by the Materials Testing Laboratory of Rose Polytechnic Institute comply with or exceed ASTM Specification C 159-59T. For a copy of these Specifications, see your TFFI Handbook or write nearest member for one.



ARMCRE
Ayer-McCord Clay Co., Inc.
Brazil, Ind.

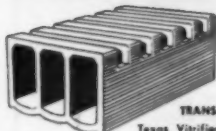


DICKEY
W. S. Dickey Clay Mfg. Co.
P.O. Box 2028
Kansas City 42, Mo.

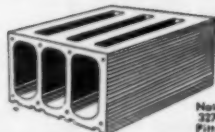


TRANSLOT
Connell Sewer Pipe Co.
Cannelton, Indiana

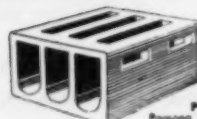
Trickling Filter Floor Institute



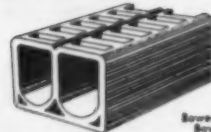
TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas



NATCO
Natra Corporation
227 Fifth Avenue
Pittsburgh 22, Pa.

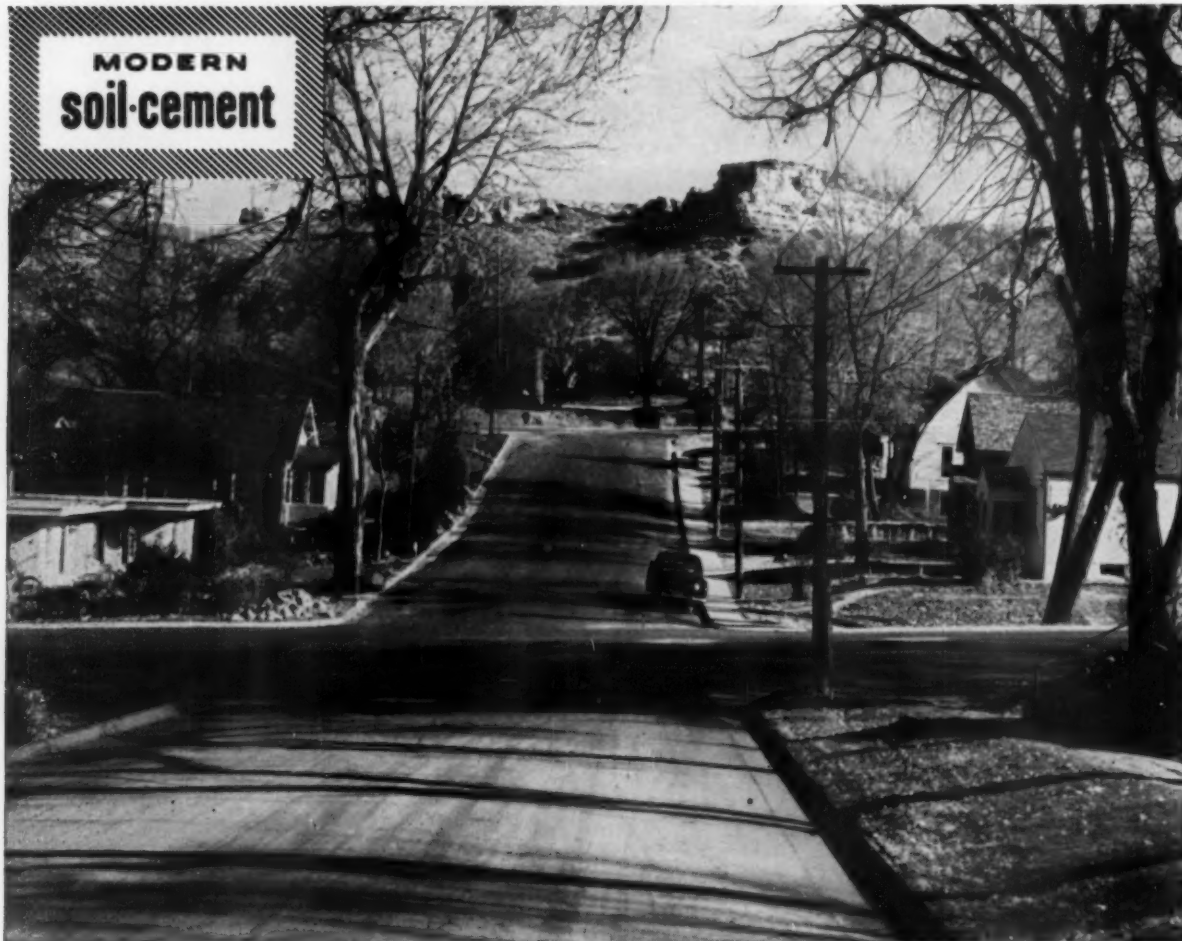


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Panama Terra-Cotta Co.
Greensboro, N.C.



BOSCO
Bowerston Shale Co.
Bowerston, Ohio

MODERN soil-cement



Wray residential streets have 5" soil-cement base with 1½" plant mix top. Commercial streets are 6" soil-cement with a 2" top. In-place material required 5% portland cement by weight.

In Wray, Colorado . . .

Soil-cement pavement for 84 blocks of streets bid at 18% under competition

The lowest-cost, precision-built pavement there is! 75% of the materials are usually free!

When officials of Wray, Colorado, took bids for paving 84 blocks of streets, they found that soil-cement would save them 18% compared to the cost of flexible pavement. So satisfactory were the results that 8 more blocks were added to the original contract. Thus, 92 blocks (8 of which are commercial) are now paved with soil-cement.

Soil-cement costs less to lay because the main ingredients can be

soil, gravel or broken-up blacktop. Mixed with portland cement and water, rolled solid and topped with a thin bituminous surface—the pavement's finished! It's the fastest-laid pavement there is. Experienced crews using modern machines lay up to one mile a day.

Maintenance costs stay low because soil-cement stays rigid. Inch for inch, soil-cement is the strongest pavement short of concrete. It provides beam strength that spreads traffic loads over the subgrade. Won't wash out or pothole.

No wonder, soil-cement is the

scientific answer for low-cost streets, roads, shoulders, subbases, airports and parking lots! Write for complete facts. (Free in U.S. and Canada.)



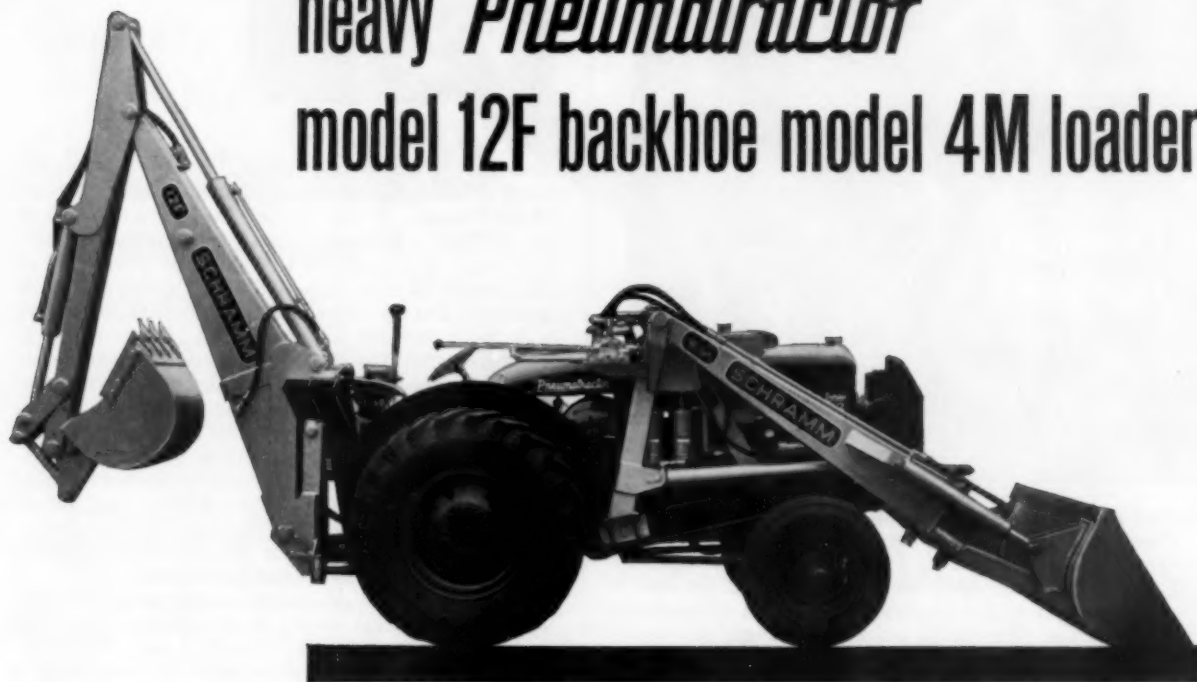
Gets stronger with age. Cores cut from soil-cement roads and streets show strength gains right from the start.

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Dept. A12-89, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of portland cement and concrete

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 heavy *Pneumatractor*
 model 12F backhoe model 4M loader



Series 62 is a self-propelled compressor . . . a 42 HP tractor . . . a heavy-duty backhoe . . . a hard-working loader . . . all in one package . . . does all four jobs . . . costs far less than separate units to do the same work.

Check these new Series 62 features:

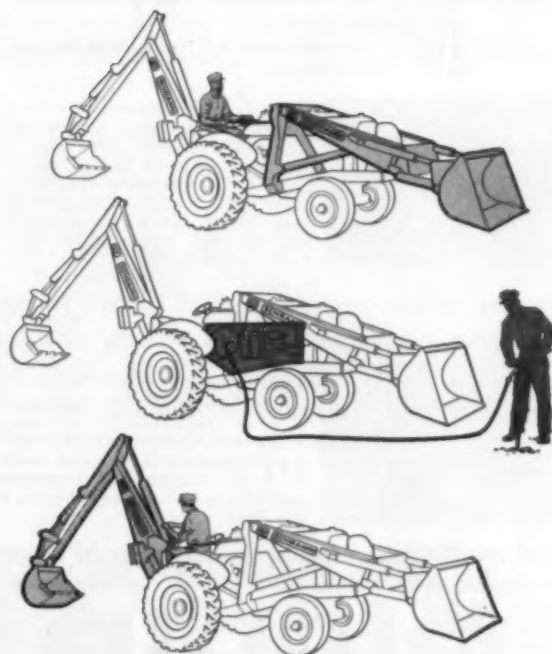
"Controlled Air Delivery" . . . now you can use your air power even while operating loader or backhoe.

New independently-mounted frame . . . relieves crankcase, clutch and transmission from operating strain.

Model 12F Backhoe . . . new heavy-duty construction . . . digs to 12'8".

Model 4M Loader . . . longer, higher reach . . . more load capacity . . . box steel construction.

These and many other new features make the Series 62 Heavy Pneumatractor the machine that costs you less . . . saves you more. For the full story write Schramm, Inc., 766 Garfield Ave., West Chester, Pa.





Cast of high-strength malleable, these new **RIGID** Conduit Benders have an exceptionally smooth, typically **RIGID** quality finish you'll like on sight. Look in the extra deep sockets, and you'll see the threads down at the bottom. Elimination of strain on threads of pipe handle reduces breakage.

RIGID Thin-Wall Conduit Benders Available in 3 Sizes

B-1677 Bends $\frac{1}{2}$ " Thin-Wall Conduit to 4" Inside Radius

B-1678 Bends $\frac{3}{4}$ " Thin-Wall and $\frac{1}{2}$ " Heavy-Wall Conduit to 5" Inside Radius

B-1679 Bends 1" Thin-Wall and $\frac{3}{4}$ " Heavy-Wall Conduit to 6 $\frac{1}{2}$ " Inside Radius



Exceptionally smooth side-walls hug conduit snugly . . . minimize distortion. Benders form conduit to meet National Electric Code Standards. Steadying foot pressure is easily applied on non-slip step plate. Easy-to-see arrows give accurate guide for back-to-back and stub bends.

RIGID Hickey-Type, Heavy-Wall Conduit Benders



B-1711 Bends $\frac{1}{2}$ " and $\frac{3}{4}$ " Heavy-Wall Conduit
B-1712 Bends $\frac{3}{4}$ ", 1" and 1 $\frac{1}{4}$ " Heavy-Wall Conduit

Here's a rugged bender for heavy-wall conduit. Deep notch in lifting hook protects threaded ends. Face of bender has hardened teeth for safe, long wearing, non-slip grip.

Call your Distributor today. For your convenience, he maintains a complete stock of **RIGID** Work-Saver Pipe Tools and parts!



About Our Cover



Raymond J. Faust, Executive Secretary of the American Water Works Association, is now in his third year of filling the hard-to-fill shoes of "Mr. Water Works"—Harry Jordan. He joined the staff of the AWWA in February, 1951, as Executive Assistant Secretary, retaining that title until the retirement of Mr. Jordan in 1959. A native of Millersburg, Pa., he attended Pennsylvania State University, receiving a B. S. in Sanitary Engineering in 1923 and a C. E. degree in 1935. His experience in sanitary engineering was acquired with the Michigan Department of Health Division of Engineering, which he served from the time of graduation until 1951, when he was Chief of the Water Supply Section.

While in Michigan, he became a charter member of the Michigan Section of the AWWA and served the organization at various times as Trustee, Secretary-Treasurer and Director. He is a Fuller Awardee and an honorary member of the section.

The AWWA has established a well deserved reputation for technical service to its membership, a task in which Mr. Faust has had no small part. The bulletins displayed in the cover photo represent only a small portion of those available at the AWWA office. This service has been a valued one and there is every indication that it will be expanded.

Mr. Faust believes that the water works industry in the United States and Canada has accomplished much: Our public water supplies are safe and they are dependable, with outages rare as utilities go. He feels however, that the greatest challenges are ahead, that the industry must endeavor to meet two objectives. These are 1) elimination of restrictions on water use and 2) meeting standards of water quality above and beyond mere safety requirements. Providing improved management with realistic water rates, undertaking advance planning and obtaining public support for the objectives are believed to be the keys to meeting these challenges.

Mr. Faust considers that the qualifying educational level for water utility managers must be raised to secure better management; to do this, an early step would be making salaries commensurate with the desired educational level. Money will be needed for this step, and also for correcting existing deficiencies in water systems, for continuing improvements to meet population growth and for undertaking improvements in treatment to produce a quality water. The average water rate structure would have to be doubled to meet these demands.

The objectives are worthwhile and doubtless will be achieved. Time is the factor that will measure success and this in turn will depend on methods. The AWWA is a dynamic organization with leadership abilities appropriate to the occasion. □ □ □

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in old piping!*

MUELLER® copper meter yokes

NEW compression couplings

*...for steel or copper pipe
...with or without
locking nut*



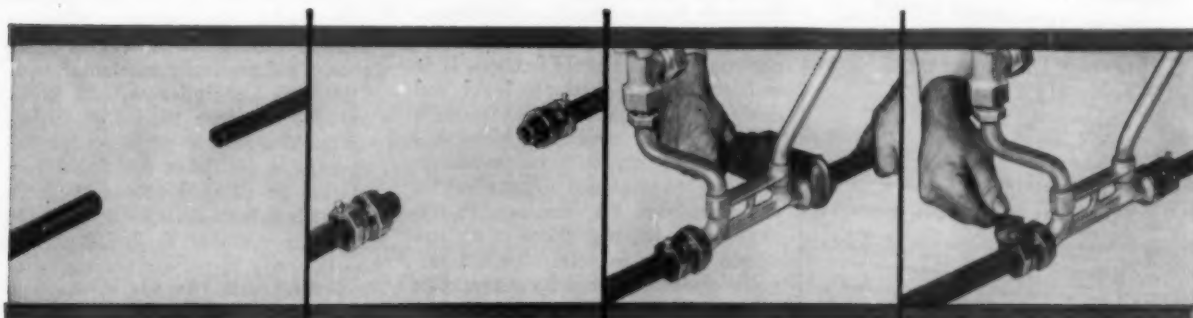
You can now install Mueller Copper Meter Yokes in any existing steel or copper piping in just a few minutes — and without cutting threads or sweating joints.

The simple step-by-step procedure for installing a yoke with Mueller's new Compression Couplings is shown below. Permanent, water-tight joints are quickly made even on rough and badly pitted pipe. Possible trouble is avoided because the piping does not have to be moved.

These new, time-saving couplings are now available for all Mueller Copper Meter Yokes with Multi-Purpose Ends. Regular compression nut or locking nut designs can be furnished for steel or copper pipe.

The locking nut type (shown) positively prevents any movement of the yoke on the pipe and insures continuous electrical bonding of the service piping.

Write for complete information and specifications on Mueller's Copper Meter Yokes.



1 Clean dirt, rust and scale from pipe and cut out a section just slightly longer than yoke (without coupling).

2 Remove all burrs from inside and outside of pipe and slip complete coupling over cleaned ends of pipe.

3 Align yoke between ends of pipe, slide couplings into place and tighten couplings securely onto yoke body.

4 Tighten compression nuts on pipe and lock yoke in place by tightening locking set screw on clamp. Setting complete.

Copper Meter Yokes are just a portion of Mueller's complete line of quality-matched meter setting equipment.



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ORLANDO, Florida



UNIT OPERATIONS OF SANITARY ENGINEERING

This book has an ambitious goal—to provide a text to equip the graduate to rationalize his approach to design problems, a need considered to exist in present graduate sanitary engineering curricula. The author, Linvil G. Rich, Head of the Civil Engineering Department at Clemson College, recognizes that sanitary engineering design as now practiced is empirical. To meet the challenge of the broadened "environmental health" scope of activities of the sanitary engineer, he anticipates a change by the profession to a rational basis. The result of Doctor Rich's efforts is a textbook covering the principles of unit physical processes as they may apply to design situations in water and waste systems, stream sanitation, air pollution abatement and radiological health. The teaching of unit operations is well established in chemical engineering curricula, and this text adapts many chemical engineering principles to sanitary engineering processes. Typical chapter headings are Fluid Transport in Closed Conduits, Mixing, Sedimentation, Flow Through Beds of Solids, Gas Transfer, Heat Transfer and Psychrometry and Humidification. It is written for the graduate level and designed for a four semester-hour course in unit operations. Many examples are given to demonstrate sanitary engineering application of the principles. For instance, in the chapter on mixing, there is an example of how to determine the impeller speed required for a propeller mixer and the power consumption. In the chapter on gas transfer, the reader is shown how to size a scrubbing tower to remove hydrogen sulfide from waste air. Other examples demonstrate the sizing of vacuum filters, sludge cake dryers and flotation units. Doctor Rich has done a remarkable job of combing the literature to bring the process principles into focus. Illustrative material is adequate and confined to graphical presentation and line drawings. This 308-page book is

primarily a graduate student's text but the practicing engineer will find it of value as a reference work. It is available from John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. The price is \$10.75.

FILTRATION

The application of filtration devices, the history of their development and theories involved in evaluating filtration practice are detailed by George D. Dickey, an engineer who has devoted his career to studying the art. The scope of the book is purposely broad; Mr. Dickey defines filtration in part as that phase of liquid-solid separation "wherein the solids are undissolved and the separation is caused by forcing the liquid through a porous medium which retains the solids..." This permits him to give attention to many types of apparatus including screens, gravity sand filters, vacuum and pressure filters and centrifuges. Descriptions of these follow chapters on history and theory and comprise most of the first half of the text. One chapter gives an informative discussion of filter media; two others are concerned with adjunctive procedures as chemical conditioning, coagulation and filter cake production control. While the author handles the subject in its broad sense—filters and what they will do—there are separate chapters on specialized applications: Oil and petroleum refinery filters, water filtration and sewage clarification and sludge dewatering. There are some helpful suggestions on what one should know before he designs a plant to include mechanical filters or purchases a filter for a particular task. The book concludes with a bibliography of more than 1,000 references. The text is prepared for engineers in all fields desiring information on all applications of filters, but it is oriented sufficiently for the sanitary engineer to find it useful, particularly in understanding vacuum filters and porous media employing filtration aids. The book has 362 pages and is priced at \$12.00. The publisher is Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y.

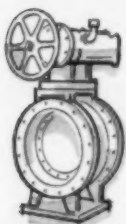
MUNICIPAL REFUSE DISPOSAL

This book describes in detail the operations of the seven major disposal methods—sanitary landfills, central incineration, on-site incineration, garbage grinding, feeding gar-

In the Mines of California's Mother Lode...



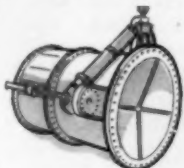
... B-L-H's Pelton Division got its first practical experience in water control. That was over 85 years ago. Since then Pelton has gone on to establish an international reputation for excellence in hydraulic design and construction. Its leadership is especially evident in waterworks equipment, where its diverse line assures an answer to virtually any problem.



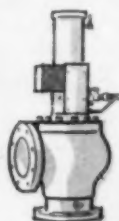
In butterfly valves, for instance, Pelton makes both the rubber and metal-seated kinds, and in sizes from 6 in. to 17 ft. All Pelton butterfly valves are equipped with heavy bronze-bushed bearings for the main shaft. These bearings can be readily removed from the valve body without dismantling the valves. Another valve—this one Pelton-developed—often chosen for waterworks shutoff is the spherical



type, which, because of its simplicity greatly reduces head loss and maintenance expense. Like the spherical valve, the Larner-Johnson valve owes much to Pelton engineering. Easily adjusted, Larner-Johnson valves can be built to withstand pressures up to 1300 psi and are particularly applicable to throttling service or flow control such as discharging water from high-pressure mains to distributing lines. Pelton also makes three hollow-type valves—cone, stream and jet.



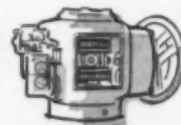
All can be used for free discharge or bypass and all can be operated manually, hydraulically or by electric motor. Often used in conjunction with each other are two more valves



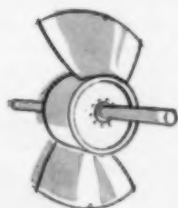
built by Pelton—automatic dashpot-controlled air valves, widely used in flow lines, and surge suppressors. The latter afford excellent protection for pump discharge lines, preventing excess pressure when the



pumps are stopped. All the valve types mentioned here can be run with the Pelton Motor Operator, which uses a planetary gear system (thus eliminating the clutch) and which provides torque protection in both directions at no extra cost. We might also mention one other



kind of Pelton water control equipment—axial flow pumps. These may be equipped with either fixed blade or variable pitch impellers. Where low or medium head, high operating efficiency and large discharge capacity are important factors, Pelton pumps can provide the answer at relatively low cost.



For further information on any Pelton valves or pumps, write Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif., or B-L-H Corporation, Philadelphia 42, Pa.

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bage to swine, composting and salvage and reclamation. In addition, it evaluates those methods as a guide for municipal officials who must determine what disposal methods the city should use. Such factors as size and type of city, geography and climate, public health, costs and financing, public acceptance, relationship to collection practices, and effects on other municipal services are analyzed. The manual covers other factors, such as determination of the quantities of refuse that a municipality must collect and dispose of; and how to handle such special problems as disposal of construction and demolition wastes, automobiles, condemned foods, industrial wastes, explosive and hazardous wastes, pathological wastes and refuse from disasters. It was written by the Committee on Refuse Disposal, American Public Works Association and is published by Public Administration Service, 1313 East 60th Street, Chicago, Ill. 522 pp., cloth, indexed, illustrated, selected bibliography. \$8.

REFUSE COLLECTION AND DISPOSAL

This is an annotated bibliography of 358 articles, papers and other published material on municipal refuse collection, storage and disposal. The 73-page document covers the period 1958-1959, and is the fourth such supplement issued by the Public Health Service. The text is arranged in sections which correspond to the various administrative and operational phases of the refuse disposal field. All references have been annotated for increased utility by federal, State, and local refuse collection officials; 22 periodical publications and 7 other publications have been cited and an author's index is included. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at 45 cents per copy.

BRIDGE DESIGN STUDIES: PILING TESTS

Three papers in this publication refer to bridge design. They are: Transfer of load between precast bridge slabs by Adrian Pauw and John E. Breen, University of Missouri; dynamic tests on a 3-span continuous I-beam highway bridge by C. L. Hulsbos and D. A. Linger, Iowa State; and rapid method for estimating maximum bending stress in simple span highway bridges by H. K. Stephenson, Texas A & M. A report on a test pile program by

J. A. Williams of the Missouri Highway Dept. completes this Bulletin 279 of the Highway Research Board, Washington, D. C.; \$1.80.

CONCRETE PAVEMENT EXPERIMENTS

Research findings from a variety of experimental projects on portland cement concrete are reported in Bulletin 274. Included are results of tests involving performance of continuously-reinforced concrete and non-reinforced concrete, spacing of joints, corrosion of load transfer joints, merits of skewed joints, and other pavement design features. Highway Research Board, Washington 25, D. C.; \$3.40.

ASBESTOS-ASPHALT PAVING MIXTURES

A report describing test strips of asbestos-asphalt paving laid by the New York State Department of Public Works is now available. Research Report 60-5 was prepared by the Bureau of Physical Research of the N. Y. State Department of Public Works, and has been reprinted by Johns-Manville in a 32-page booklet as a public service. It describes the methods of design and construction. This is followed by an analysis of results obtained and expected, and the Bureau conclusions. Detailed data are contained in Appendices. RR 60-5 is available upon request from Johns-Manville, Asbestos Fiber Division, Manville, New Jersey.

QUALITY AND THEORY OF TRAFFIC FLOW

This publication includes five reports on highway traffic: The Quality of Traffic Flow by B. D. Greenshields; Measurement and Evaluation of Traffic Congestion by H. P. George; Travel Time Relationships by N. S. Guerin; Development of Traffic Congestion by M. R. Palmer; and Speed, Volume and Density Relationships by R. T. Underwood. There are 188 pages. Copies are available without charge "to those who indicate responsibility for highway traffic operations or a sincere interest in this field." For quantity procurement, write the Director. Copies and/or information from Yale University, Bureau of Highway Traffic, Strathcona Hall, New Haven, Conn.

CAPITAL IMPROVEMENT PROGRAM FOR CHARLOTTE

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PROBLEM: Plagued with Sewage Pumping Station Neighborhood ODOR complaints?

SOLUTION: Use Model FA-160 (Illustrated) installed over wet well. Destroys odors caused by Hydrogen Sulfide and Mercaptans, mitigates concrete corrosion and adds dissolved oxygen to sewage flow keeping it fresher and easier to treat at the plant. Cost of operation 1/2c per hour.

PROBLEM: Manhole odors at underground lift stations?

SOLUTION: Use Model US-130 installed in or above the packaged lift station. Destroys odors caused by Hydrogen Sulfide and Mercaptans, mitigates concrete corrosion and adds dissolved oxygen to sewage flow. Cost of operation 1/2c per hour.

PROBLEM: Having Treatment Plant influent channel odors?

SOLUTION: Use Model RC-260 installed at channel structure. Ozone is diffused to the liquid thereby destroying odors and increasing oxygen.

PROBLEM: Odorous influent at primary tank? High bulking of solids? Lack of Oxygen in waste water discharged to streams?

SOLUTION: Use Type EA-360 Series installed at primary or preaeration chamber for the ozonolysis of solids, destruction of odors, and cost reduction of air volumes. Increases dissolved oxygen in effluents to maintain critical oxygen balance in our many polluted rivers and streams at extremely low cost.

PROBLEM: Taste, Color and Odor potable water problems in distribution systems with no water treatment plant facilities?

SOLUTION: Use Type AJ-390 Series installed between pump and distribution system for prompt alleviation of Taste, Color, Odor water problems and reduction of water-borne pathogens. Operating costs as little as \$1.00 per day. Low initial cost.

PROBLEM: High chemical costs for water Taste, Color and Odor reduction in your water treatment plant?

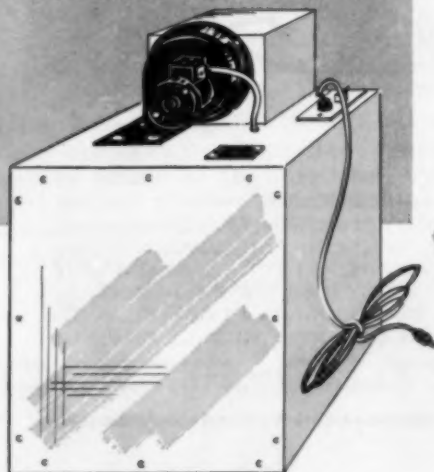
SOLUTION: Use Type IT Series installed at degasifiers and Type HS series for in-plant use for reduction of organics, iron, manganese-caused Colors, etc., vegetable, earthy, musty and phenolic Odors and Tastes at a significant cost reduction while still maintaining chlorine residuals.

PROBLEM: Got Swimming Pool Problems?

SOLUTION: Use Type SP series installed between pump discharge and pool to destroy harmful bacteria, most algae and bacteria-breeding slimes. Reduces eye, skin and ear complaints. Reduces chemical costs. Improves Color, Odor and Taste, making the pool healthfully inviting.

PROBLEM: How to get these needed facilities NOW with limited funds?

SOLUTION: INVEX, INC. provides a low cost monthly payment lease purchase plan at 6% interest.



Research and Development Since 1930

INVEX INC.

Box 1335 • 1100 N.E. 125th Street
North Miami, Florida

MR. O'THREE
SAYS "HERE'S
POSITIVE PROOF"

Read these
unsolicited statements:



"The service on our generators, from your personnel, has been prompt, efficient and courteous. The Invex Ozone Generators have met our high standards for efficiency of odor control."... (13 generators in use in Clearwater) From: D. J. Raye, Superintendent, Sewage Treatment Plants, Clearwater, Florida.

"This first machine (Invex) proved so satisfactory and impressed the writer to such a degree that we now have, here in the State of Florida, many of these machines being used for odor control in lift stations and at sewage treatment plants at such points as sludge draw-offs, inspection wells, inlet to the plant, trickling filters, etc. These machines have been improved to the point where they operate very efficiently and do an effective job for odor control."... From: Ralph H. Baker, Jr., Sanitary Engineer, Florida State Board of Health, to Mr. D. S. Abell, Butler County Health Dept., Penna.

"The job these six units have done for the City of Bradenton has been wonderful. The units have paid for themselves... With such odor controls, our publicity and public relations have been excellent... As you know, a dollar sign cannot be placed on good public relations and publicity."... (re: Invex Ozone Generators) From: Perry A. Cessna, Sewage Superintendent, Bradenton, Florida.

"We reduced raw water color from 70-90 PPM range to 30-35 PPM range by Ozone being introduced into our degasifier via the fan suction, and with this color reduction we were able to reduce chlorine demand from 160 lbs/MG to 90 lbs/MG, and produce a final color of 5 to 10 PP. From: Mr. W. A. Oeffler, Plant Manager, Water Board, North Miami Beach, Florida to Mr. L. S. Finch, Vice President and Chief Engineer, Indianapolis Water Co., Indianapolis, Ind.

Specified by more leading
Consulting Engineers than all
other generators combined



A DIVISION OF
CONTINENTAL
DIVERSIFIED
INDUSTRIES, INC.

The Man from Hobbs says:

YOU'LL HAUL
3 YARDS MORE REFUSE
IN A HOBBS HYD-PAK!*



**HOBBS
HYD-PAK**

A DIVISION OF
HOBBS TRAILERS

*... than in other refuse
packers of comparable
weight and cost!

The BIG DIFFERENCE is in the capacity ratings. With a "16-yard" Hyd-Pak, you get 16 yards in the main storage compartment, where refuse can be completely compressed. The three-yard loading hopper is not even counted (though it can be filled and used to transport refuse at the end of a run). Before you buy refuse collection bodies, you should see this true capacity in action. We'll be happy to arrange a demonstration. Just write or wire:

HOBBS HYD-PAK • 609 North Main • Fort Worth • Cable HOBBS CO

collection and disposal, water and sewer fund projects, urban renewal, municipal and airport facilities and other projects. There are 81 pages with many appropriate illustrations. W. J. Veeder is City Manager.

BUILDING FOR CLEAN WATER

This progress report on five years of incentive grants for municipal waste treatment reveals that 57 percent of the approved projects have been completed, mostly in the smaller communities. Annual investments are indicated and the backlog of required treatment work and needs for the next ten years are shown. Copies of Public Health Service Publication No. 867 are available from the Supt. of Documents, Washington 25, D. C.; for 15¢ each.

DEFENSE MATERIALS SYSTEM AND PRIORITIES

This booklet, which replaces a 1955 publication, explains why the Defense Materials System, under which priorities and allocations are administered, is necessary; and, in addition, it describes the characteristics of the system. The Defense Materials System governs operations by contractors engaged in defense programs of the Department of Defense, the Atomic Energy Commission, the National Aeronautics and Space Administration, and the other defense agencies. DMS Reg. 1, as amended December 1, 1959 contains the basic rules of the System. BDSA Reg. 2 contains the rules for priorities, and a number of M-Orders relating to specific materials and products supplement these basic regulations. For sale at Department of Commerce Field Offices and by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 25 cents per copy.

RESEARCH AND TRAINING

This brochure is intended to acquaint the scientific fraternity with either new or expanded opportunities for research and training in the area of environmental health—air pollution, water supply and pollution control, radiological health, occupational health and industrial hygiene, and environmental engineering and food protection—under the various research grant and training programs of the Public Health Service. Write Public Health Service, Washington 25, D.C.

yours from **DORR-OLIVER**



Valuable new information describing **NEW EQUIPMENT FOR ACTIVATED SLUDGE TREATMENT**

Climaxing almost 10 years of research, Dorr-Oliver® now presents four advanced developments in equipment for treatment of sewage and industrial wastes by the activated sludge process.

Thoroughly proven in full scale plant installations, they offer the consultant or sanitary engineer new opportunities for efficient sewage plant design and maximum flexibility in meeting a particular need.

Basic information is contained in the four newly published bulletins shown above. The equipment described comprises:

- 1 THE D-O® AERATOR**
An improved method for providing highest oxygenation capacities and transfer efficiencies.
- 2 THE D-O INKA AERATION SYSTEM**
A unique new design using low pressure air for activated sludge aeration.
- 3 THE DORR-OLIVER SPIROVORTEX® SYSTEM**
Combines the simplicity of Biofiltration® with activated sludge treatment performance and efficiency.
- 4 THE DORR® RSR CLARIFIER**
Minimizes sludge detention in final clarifiers. Design features allow rapid return, positive control, and visual assurance of continuous removal of activated sludge.

For copies of these bulletins, write Dorr-Oliver Incorporated, Stamford, Connecticut.



*"It puts together
mighty easy Lucy...
shecks...you ain't put together
too bad yourself"*



U.S.
cast iron
PIPE

FOR WATER, SEWERAGE AND

a honey to handle

Tyton Joint® pipe, naturally . . .

This rugged dependable pipe goes together so easily even green crews become experts quickly. Consider:

Only one accessory needed—a rubber gasket. No nuts, bolts, bell holes, caulking equipment. And Tyton can be laid in rain or wet trench when necessary.

High installation costs crowding your budget? Get the time-and-money-saving facts on Tyton Joint® pipe today. Call or write:

•U. S. Patent No. 2,953,398 •



U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A Wholly Integrated Producer from Mines
and Blast Furnaces to Finished Pipe.

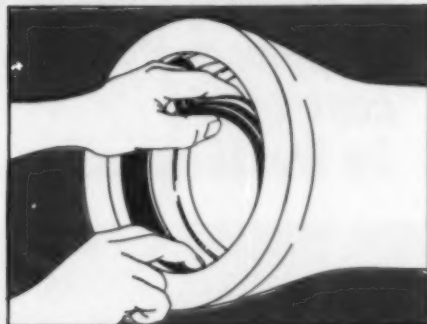
Makers of USIFLEX® Boltless Flexible Joint Pipe.

INDUSTRIAL SERVICE

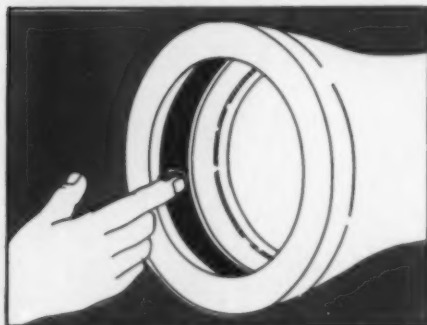
CARTER IRON

TYTON®

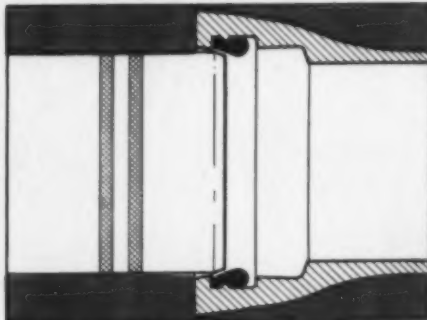
ONLY FOUR SIMPLE ACTIONS



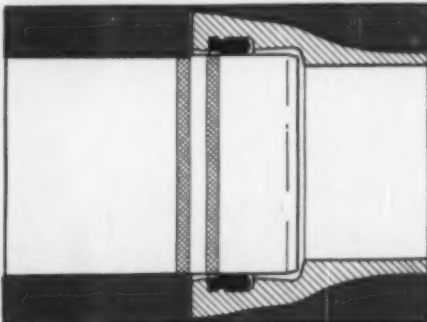
Insert gasket with groove over bead in gasket seat . . . a simple hand operation.



Wipe film of Tyton Joint® lubricant over inside of gasket. Your receiving pipe is ready.



Insert plain end of entering pipe until it touches gasket. Note two painted stripes on end.



Push entering pipe until the first painted stripe disappears and the second stripe is approximately flush with bell face. The joint is sealed . . . bottle-tight, permanently! The job's done . . . fast, efficiently, economically. Could anything be simpler?

It moves

***... powered and
controlled
by Westinghouse***

Press a button—an indoor auditorium becomes an open air stadium in 2½ minutes—and behind that button is an unparalleled story of engineering and construction cooperation.

Architectural and engineering teamwork has given Pittsburgh the world's first movable roof auditorium. This versatile structure adds to the city's renaissance, in one building, a 14,000 seat sports arena, a convention hall, open air amphitheater, and an exhibit center. Westinghouse products bring the facilities to life, give precision control for the delicate manipulation of six 300-ton movable leaves.

Outwardly, the new auditorium is a 400' stainless steel

J-94176-1



umbrella, suspended from a space frame cantilevered from the ground. That is one outstanding construction teamwork story.

Inside, coordination culminates in a control console located high above the seating area. From this station the

Construction Motivators: The Authority & Industry

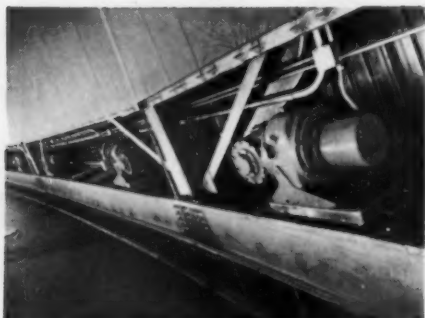
l to r seated: Judge A. L. Wolk, Vice Chmn.; N. Stabile, Sec'y Treas.; W. B. McFall, Chairman; H. R. Edelman, Jr., Pres. Heyl & Patterson; and D. J. McDonald, Vice Chmn.

standing: C. B. Jansen, Member; J. E. Payne, V. P. Westinghouse; and Edw. Fraher, Exec. Director



J-04176-2





The six movable roof leaves are driven by Westinghouse right angle gearmotors, five to each leaf. Photo shows base of one of the movable leaves with the acoustic ceiling panels removed.



O. M. Newman, Heyl & Patterson, and Edward Cohen, Ammann & Whitney, discuss roof electrical drive with C. G. Falkenstein, Westinghouse, kneeling in front of main roof reactor control cabinet.



unique movable roof drive system is activated. An AC reactor control scheme keeps all six movable leaves in step throughout open and close cycles. Each leaf is driven by Westinghouse Moduline® gearmotors, with opposite leaves being operated in pairs.

Close cooperation among architects, engineers, owner, contractors and Westinghouse helped to provide a system flexible enough to serve varying building demands, with the high degree of electrical reliability required.

For more complete information on the electrical aspects of construction, write to: Westinghouse, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-94176-3



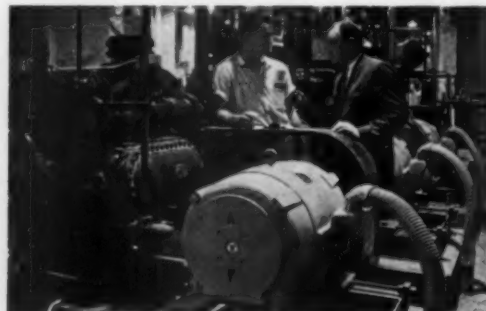
5KV metal-clad switchgear contains a tie-breaker to provide emergency switching between two incoming 4160-V lines. Seen here: N. J. Grady, V. P. Ernst, C. J. Long, and A. B. Janaszek.



Checking construction progress are C. J. Long and F. J. Sarknas, Westinghouse. In background, 1500 kva power center supplies power for building auxiliary and air conditioning compressor motors.



Westinghouse Motor Control Center located in the Mechanical Room centralizes auxiliary motor controls. Discussing installation advantages are H. R. Helvenston, C. J. Long and N. J. Grady.



Three 125 hp Lifeline A motors drive freon compressors to chill brine supply for ice rink piping. Seen here are P. F. Schad, Limbach, and C. G. Falkenstein, Westinghouse.



Operator's view from roof control console high above the spectator area. Visible through the glass front is the juncture of the first two movable leaves of the roof.



One of main power transformers rated 2500 kva at 11.6 kv to 4160 volts. Discussing the power supply are C. J. Long, Electrical Engineer, M. A. Geffel, Ernst, and A. B. Janaszek, Westinghouse.

Builder: Public Auditorium Authority of Pittsburgh & Allegheny County: *Resident Engineer & Supt. of Construction:* H. Rey Helvenston

Architects: Mitchell & Ritchey, Pittsburgh

Roof Designers & Engineers: Ammann & Whitney, N.Y.

Electrical Engineer: Carl J. Long & Associates, Pittsburgh

Mechanical Engineer: John Mullin & Associates, Pittsburgh

General Contractor: Dick Corporation, Large, Pa.

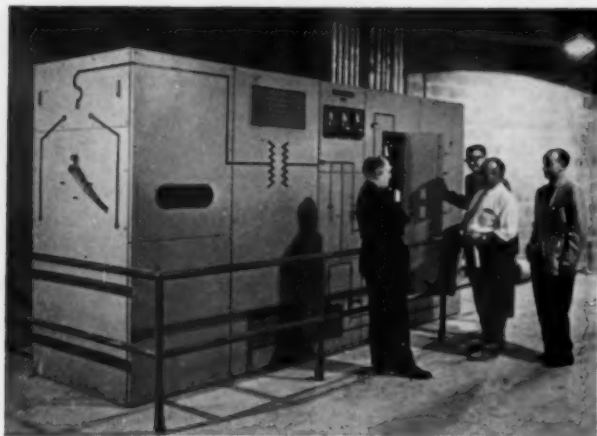
Electrical Contractor: E. C. Ernst, Inc., Pittsburgh

Mechanical Contractor: Limbach Company, Pittsburgh

Drive System Contractor: Heyl & Patterson, Inc., Pittsburgh



Westinghouse



Another Westinghouse power center, this 300 kva ASL dry type supplies lighting and auxiliary power. Discussing its component parts are C. J. Long, A. B. Janaszek, M. A. Geffel and Albert Simon, Ernst.



Type M Electric Stairway transports 8,000 persons/hr. Top to bottom: E. R. Gallagher, supervising architect; H. R. Helvenston, resident engineer; and A. Simmonds, Westinghouse Elevator.



Fan room equipped with series 8000 Air-Foil centrifugal fan and air conditioning coils. W. Y. Humphreys, Westinghouse, with John Mullin, Consulting Engineer, air conditioning and ventilation system designer.



Westinghouse mercury vapor parking area and floodlighting are operated from this remote control panel located in the mechanical room. M. A. Geffel, Ernst, tests lighting circuits.

IN BROOKINGS COUNTY, S. D.

COST RECORDS SPEAK

ONE OF THREE Cat No. 12 Motor Graders owned by Brookings County helps maintain some 500 miles of county and township roads. Brookings County also owns three Cat D7 Tractors and a 944 wheel-type Loader.



The Commissioners of Brookings County, S. D., wanted to know how much it cost to operate *each* of the county's nine motor graders. So, back in 1957, the Highway Department began to keep cost records on individual machines.

Result? Look at Highway Superintendent Gene R. O'Connor's cost chart on the opposite page.

Note that the three Cat No. 12 Motor Graders cost less per mile to operate than any of the other six machines, representing four different makes. The average cost per mile for the three Cat machines was \$0.61; average cost per hour was \$2.41.

Even the first machine listed has an impressive record—yet this is a 1945 model, built before Caterpillar introduced the exclusive oil clutch.

Comparing this first machine with the other two

Cat Graders indicates the cost-saving advantage of the oil clutch. Mr. O'Connor reports that the second listed Cat Grader received its first clutch adjustment after 5000 hours. No clutch adjustment has been required on the third grader in 6615 hours.

Records *do* speak for themselves. They enable you to take into account the cost of operation and repairs—a practical yardstick which helps determine a machine's true value.

Are you keeping records on your individual machines? It takes only a few minutes a day. Your Caterpillar Dealer will be glad to supply you with free Cost Record Books that may help you set up a more useful record system.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

FOR THEMSELVES

MOTOR GRADER COST RECORDS are presented to Brookings County Board Chairman Edward Tofte (right) by Highway Supt. Gene R. O'Connor. Seen in the background are (from left) Commissioners Louis Overocker, Louis Heesch, E.D. Robertson and O.P. Dahl.



MOTOR GRADER COST RECORDS, Brookings County, S.D., 1957 through 1960

Make	Total Operating Cost	Total Hours	Total Miles	Cost Per Hour	Cost Per Mile
Cat No. 12	\$20,830.64	8064	28,204	\$2.58	\$0.74
Cat No. 12	22,541.26	8970	39,062	2.51	0.59
Cat No. 12	10,623.22	4944	20,377	2.15	0.52
Brand A	13,555.37	4181	14,933	3.24	0.90
Brand B	23,578.04	8111	27,449	2.91	0.86
Brand B	16,551.69	5762	19,754	2.87	0.84
Brand C	8,263.82	3283	10,182	2.52	0.81
Brand C	21,122.89	7585	25,298	2.78	0.83
Brand D	16,550.20	5918	21,755	2.80	0.76

COUNTY'S COST RECORDS include, in addition to miles and hours, the cost of fuel, oil and grease, parts and supplies, labor, repairs and operators' wages.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

EQUIPMENT AND MATERIALS

For Your Public Works Program

NEW LISTINGS

Helpful Information For Coating Reservoirs

25. Costs, application data and a case history on coating reservoirs with "Weathercoat," a tough coating that is odorless, non-toxic and moisture proof are described in this four page bulletin. Check the reply card for Bulletin B-22 or write direct to American Bitumula & Asphalt Co., 320 Market St., San Francisco 20, Calif.

24-Page Bulletin on Swing Check Valves



is available from Darling Valve & Mfg. Co., Williamsport, Pa., or by checking the reply card.

36. This illustrated bulletin describes how the revolving double disc principle has been adapted to Darling swing check valves, which incorporate all applicable features of AWWA and Federal specifications. Bulletin includes a pressure rating table on the 2 to 16 inch valve sizes and construction details. Bulletin 6102

How to Cut Highway Grass Maintenance Costs

46. This valuable 26 page bulletin, illustrated in four color, answers all your questions about chemical growth retardants. Learn how you can reduce your grass maintenance costs by using MH-30. For your copy of Booklet No. 11 write to Naugatuck Chemical Division, Dept. A, Elm St., Naugatuck, Conn., or use our readers' service card.

New Permutit Type M Precipitator Bulletin

47. A six page bulletin describes fully in text and illustration the new Permutit Type M Precipitator. This is a unique sludge-blanket clarifier whose agitator arms are driven by water jets at the tips. Operating graphs, results of tests and dimensional chart are included. For your copy of the Type M bulletin write to Permutit, 33 West 43rd St., New York 36, N.Y., or use our reply card.

Tips For More Efficient Snow and Ice Control

51. Of special interest in this folder is the section on preparation for the approach of ice and snow. These "Hi Way Tips" should be studied by all engineers. For your copy circle number 51 on our readers' service card or write to Highway Equipment Co., 616 D Ave., N.W., Cedar Rapids, Iowa.

Recording Meter for Small Sewage Plants

89. Details on a recording rate-of-flow meter specifically built for operation with small, or packaged type, sewage disposal plants are offered in Simplex Bulletin 405. This pre-engineered standard capacity unit is used with 90° and 60° "V" notch weirs. For your copy write to Simplex Valve and Meter Co., 7 East Orange St., Lancaster, Pa., or check the inquiry card.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

New Information on Roadway Luminaires

60. A new concept in open refractor luminaires, the Westinghouse Quadroliner, is presented in an interesting 4-page folder that shows advantages and roadway luminaires characteristics. For a copy of Booklet B-8236 write to Westinghouse Lighting Division, Edgewater Park, Cleveland, Ohio, or use our reply card.

Does Refuse Removal Cost Too Much?

66. To help you with your analysis of refuse removal costs, Hydro E-Z Pack Div. of Hercules Galion Products, Inc., Galion, Ohio, offer two new cost analysis forms. Use of the forms will help determine relative efficiency of your present refuse collection equipment. Use the reply card to get this material.

Relamping the Easy Way

85. Data on a lowering mechanism for easier street light maintenance is available from Pfaff & Kendall, 84 Foundry St., Newark 5, N. J. This mechanism permits lowering of specific luminaires to ground level for relamping or maintenance. Write direct to manufacturer, or check the reply card.

Compact Snow Removal Units Offered in Two Models

107. Heavy duty, one-man rotary snow removal units, riding and walking operator models, move up to 150 tons of snow per hour. Made by manufacturers of the advanced Snowblast highway rotary, these units are designed for municipal use. For full information on Models R-40 and R-140 write American Snowblast Corp., 1237 Shoshone St., Denver 4, Colo., or use reply card.

Readers' Service Index

New Catalogs	34 & 36
Business	36
Refuse	36
Streets & Highways	38
Water Works	40 & 42
Lighting & Traffic	42
Sewerage & Wastes	44 & 46
Construction	46 & 48
Snow & Ice Control	48

Sewage Treatment For Individual Homes

84. A bulletin describing the Jet Aeration System an efficient, practical and economical sewage disposal system for individual homes is available from Jet Aeration Sales Company, 1220 W. 6th St., Cleveland 13, Ohio. Use the reply card.

Providing Water For Peak Loads

94. Need extra filtration capacity to meet peak load water demands? Investigate details of B-I-F's low-cost filtration system built around performance-proved vacuum diatomite filters. Helpful engineering information in comprehensive catalog and data sheet compilation titled "It's A Fact." Check reply card or write B-I-F Industries, Box 276, Providence 1, R. I.

Octa-Tube Lighting Standards

98. Octagonal tapered lighting standards which accommodate all types of luminaires are described in a new 28-page catalog. Accessories for modernizing older-type street lighting standards are included. Write to Millerbernd Mfg. Co., Winsted, Minn., or use the reply card.

Dispose of Brush and Branches the Easy Way

100. Six page bulletin explains the time saving advantages of a Mitts & Merrill brush chipper and shows how you can turn brush and branches into a useful product. For a copy of Bulletin 861 write to Mitts & Merrill, Saginaw, Mich., or check the reply card.

Post Hole Digging Made Easy

110. Gasoline powered Porta-Hole digger is claimed to dig a 30" post hole in 30 to 40 seconds. Works close to existing foundations, walls, fence posts and other obstructions. For further information write to Cross Manufacturing Co., Inc., Lewis, Kansas, or use reply card.

Ultra-Sonic Vehicle Detector Mounts Over Roadway

127. A few typical applications of the Model STD Ultra-Sonic Vehicle Detector are vehicle counting at the entrances and exits of parking lots, automatic operation of gates and ticket spitters and detection of traffic flow in tunnels or on bridges. Write to Electronic Control Div., Box 600, Rochester 2, New York, or use reply card for this four page bulletin.

Air Compressor, Backhoe and Loader All on One Unit

132. A bulletin is available on the series 62 Heavy Pneumatractor with backhoe and loader. It will pay to investigate this "triple threat" machine. Write to Schramm, Inc., West Chester, Pa., for your bulletin or use our reply card.

New Snow Fighting Equipment

134. Information on a new snow melting machine is available from Peabody Engineering Corporation, 232 Madison Avenue, New York. In a recent demonstration 15 tons of shaved ice was melted in 22 minutes. Write direct or use our reply card for additional data.

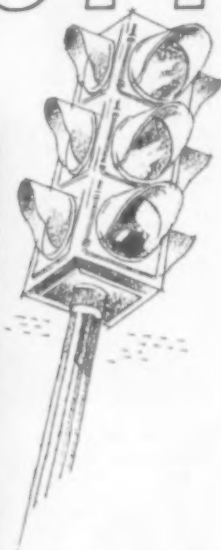
Disposable Sweeper Brooms

145. Lower first cost, longer life span and labor savings are advantages offered by Uniloy Throwaway Gutter Brooms. A four page bulletin gives details. Write United Engineering Mfg. Co., 565 E. Edna Place, Covina, Calif., or circle number on reply card.

ELECTRO-MATIC® CONTROLLER 877

A two-phase, full-actuated controller incorporating ...

- Time-Waiting Gap Reduction
- Last-Car Passage Timing



... two original Electro-Matic features never before offered in a basic type control.

Gives you more in a basic traffic controller

Controller Model 877 introduces a new, improved method of control for signaling a two-street intersection. It is a two-phase, full-actuated controller which incorporates two original Electro-Matic features never before offered in a basic type control.

REQUEST
BULLETIN
C-145

- 1 TIME-WAITING GAP REDUCTION** — The longer traffic waits against the red light, the more closely spaced vehicles moving on the green light must be to retain the right of way.
- 2 LAST CAR PASSAGE TIMING** — Once waiting traffic has preempted control by virtue of the gap reduction feature, the controller makes certain that the end of the green street platoon clears the intersection before the right of way is transferred.

The 877 is an extremely versatile control. Any two-phase intersection with widely fluctuating traffic is handled with high efficiency.



AUTOMATIC SIGNAL DIVISION LABORATORY FOR ELECTRONICS, INC.
NORWALK • CONNECTICUT

To order these booklets check card opposite page 34.

NEW LISTINGS (Cont.)

Small Sewage Treatment Plants Handle 3000 to 18,000 gpd

133. Design data on small sewage treatment plants for municipal, commercial or institutional use are presented in Yeomans bulletin No. 1510. Cross-section drawings and text explain the construction and operation of a complete small plant. Circle number 133 on the reply card or write Yeomans Brothers Company, 1999 North Ruby St., Melrose Park, Ill., for your copy.

Ventilation for the Protective Shelters

138. "Ventilation and Air Purification Equipment for Civil Defense Protective Shelters" is the title of a new 26 page booklet. The booklet details filtration systems recommended for OCDM approved fallout shelters for the home and larger units for community shelters. For a copy of this booklet write to Flanders Filters Inc., Riverhead, N. Y., or use our reply card.

Constant-Flo Incinerator Stoker

140. Increased efficiency at a lower cost is one of the claims of the Flynn & Emrich constant-flo incinerator stoker with alternate moving stoker bars. An attractive six page bulletin, No. 1705, is available from Flynn & Emrich Company, Holliday and Saratoga Streets, Baltimore 2, Md. Use the reply card.

Bulletin on Centrifugal Sand Separators

141. An efficient system for removing objectionable sand and other solids from well water is explained in a 12 page folder issued by Equipment Engineers Inc., 737 Loma Verde Ave., Palo Alto, Calif. Use our reply card to secure this valuable catalog.

To Simplify Monitoring of Odors in Water

142. The Gerstein Continuous Odor Monitor, refined to accommodate equipment and controls in a single, compact instrument, described in a helpful bulletin from Edgewater Equipment Corp., 5555 No. Sheridan Rd., Chicago 40, Ill. Use the inquiry card.

Sewer Cleaning Equipment

146. A new 4-page catalog of "Powered Sewer and Pipe Cleaning Equipment" illustrates and describes the complete O'Brien line of power rodders, bucket machines, cable machines, power rod drives and accessories. Address O'Brien Mfg. Co., 5632 Northwest Highway, Chicago 46, Ill., or circle our card-number.

Low Cost Odor and Taste Removal

147. Kill sewage treatment odors, also remove taste and odors in water, by electronics, not chemicals. Write for folder 0-3 to InveX Inc., P.O. Box 1135, North Miami 61, Fla., or use our reply card.

BUSINESS ADMINISTRATION

Save Space

By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

If You are Considering a trustee for a Bond Issue Check with Chase Manhattan

236. For details on how a bank serves as trustee for bond issues for any municipal or governmental unit, write The Chase Manhattan Bank, 1 Chase Manhattan Plaza, New York 15, N. Y.

Stop Waste in Hand Washing

497. Quick cleanup after the job with a saving of soap and your employees' time is easy with Gojer hand cleaner and dispensers. You'll find it pays you, too. Get details from Gojer, Inc., Box 991, Akron 9, Ohio.

REFUSE COLLECTION AND DISPOSAL

What You Should Know

About Refuse Incineration

30. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217A and 223A from Nichols Engineering & Research Corp., 80 Pine St., New York 5, N. Y. Just check the reply card.

Where Does It Go From Here?

63. That is the title of new 12-page booklet, D 930, with thorough discussion of garbage disposal by sanitary landfill method. Read the latest report from the experts. Caterpillar Tractor Co., Peoria, Ill., or check card.

Load-Packer 600 Points the Way to the Best in Refuse Collection

188. Bulletins W-200, W-220 and W-221 explain how the Gar Wood Load-Packer gives faster operation, bigger payload, more compaction, a larger hopper and more dependable operation. Write Gar Wood Industries, Inc., Wayne, Mich., or check the reply card.

Literature Describes M-B

Contain-O-Pack System

190. A 6-page catalog describing the M-B Contain-O-Pack, a complete low cost containerized refuse system for private haulers and municipalities is available from M-B Corp., New Holstein, Wisc. Check the reply card.

Specifying Dump Bodies and Hoists

230. Here's help in simple language for the engineer and official who has to specify equipment, from truck to body, for refuse collecting and hauling. A new contribution that has been long lacking. Write for Bulletin BH-59110 to The Heil Co., Body and Hoist Div., Milwaukee 1, Wisc., or use reply card.

How to Construct

A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

Methods and Benefits

of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin MS-1159.

Progress in Refuse Removal

495. . . . registers a new high mark with the Hobbs Hyd-Pak 60 model. Gives lower loading height, watertight body, 3 "extra" yards all in one ultra-modern, proven piece of equipment. For details on this unit and a pick-up container system, address the Hobbs Hyd-Pak Division, 609 N. Main St., Fort Worth, Texas.

Best Way to Beat the

Long Haul Problem on Refuse

547. . . . is fully described and illustrated in this new folder. Tells how your Dempster equipment containers can be converted for super-service. Gives you the step-by-step process to modernize what you have now. Write for Folder 6073 from Dempster Bros. Inc., Knoxville 17, Tenn., or just circle the number on our card.

Something New in the Incinerator Field

577. A reciprocating grate stoker described and illustrated. Brochure shows how it provides new answers to old incinerator operating problems. Just write for Pamphlet 701 to Detroit Stoker Co., Monroe, Mich., or circle number on the card.

McCONAUGHAY LICENSEES Operating K. E. McConaughay Emulsified Asphalt Plants

ALABAMA

Vulcan Asphalt Refining Co., Cordova

COLORADO

Bituminous Material & Supply Co.,
4304 E. 60th Ave., Denver

FLORIDA

E. A. Mariani Asphalt Co.,
Hooker's Point, Tampa

ILLINOIS

Emulsions, Inc., Lawrenceville

INDIANA

Bituminous Materials Co., Inc.,
P. O. Box 1507, Terre Haute
Wabash Valley Asphalt Co.,
Terre Haute
Walsh & Kelly,
3500 W. 47th Ave., Gary
Brookman Construction Co.,
17th & Gharkey Sts., Muncie
Faubert Construction Co., Lafayette
Asphalt Materials & Construction, Inc.,
4900 W. 86th St., Indianapolis
Bituminous Materials Co., Inc.,
215 Swihart St., Columbia City

IOWA

Bituminous Materials & Supply Co.,
1211 Grand Ave., West Des Moines
Plants: Spencer, Algona, Remsen,
Davenport, 2 Portable Plants

KENTUCKY

Emulsified Asphalt Co., Kuttawa

MAINE

Doherty and Swearingen Co.,
53 Main St., Yarmouth

MASSACHUSETTS

James Huggins & Son, Inc.,
Medford & Commercial, Malden 48

MICHIGAN

Bituminous Materials Co., Inc.,
318 Atlantic St., Bay City
Bituminous Materials Co., Inc.,
Escanaba
Bituminous Materials Co., Inc.,
416 S. Water St., Jackson

NEW JERSEY

Emulasta Products, Inc.,
P. O. Box 37, Mt. Holly

NEW YORK

Albany Asphalt & Aggregates,
75 State St., Albany
Bimasco, Inc., 312 Brook St.,
Bayside, L. I., N. Y.

NORTH DAKOTA

T. J. Pounder & Co.

OHIO

C & C Emulsions, Van Wert

SOUTH CAROLINA

Seaco, Inc.,
2700 Industrial Drive, Columbia

TENNESSEE

Asphalt Products Co., Inc.,
Powell Ave., Nashville 4
East Tennessee Emulsion Co.,
3107 McClure Lane, S. E., Knoxville 1

TEXAS

Texas Emulsions, Inc.,
8700 Balcones Trails, Austin

CANADA

T. J. Pounder & Co., Ltd.,
1474 Wall St., Winnipeg, Man.
(4 plants)
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Eastern Representative:

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Nothing so needs reforming
as other people's habits.

—Mark Twain

I GUESS EACH of us is a reformer at heart, and I'm certainly no exception when it comes to using calcium chloride for snow and ice clearance. Nothing burns me more than seeing the taxpayers' money wasted by great quantities of salt used on winter roads. Even then salt doesn't keep the roads clear.

So when I was asked to speak to the state highway commission last week, I really got carried away. With charts I showed how calcium chloride-salt mixtures melt ice faster, with less total chemical used. And a fact very important to the highway department is the way calcium chloride keeps abrasive piles loose in any temperature. No residue is left on pavement, floors, or equipment.

After the speech, Gary Smith came over to shake my hand. "Sproule," he said, "you've almost convinced me to use calcium chloride on my county's roads. There's only one thing that holds me back. Do you give trading stamps?"

We don't give stamps, but we do give a helpful folder, "How to Make Icy Surfaces Safe with Wyandotte Calcium Chloride". Write for it today. Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan. Offices in principal cities.

WYANDOTTE CHEMICALS



MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

STREETS AND HIGHWAYS

New Literature on Tractor Loaders

55. Full illustrated descriptions on Allis-Chalmers TL-12 and TL-14 Tractor Loaders are furnished in bulletins MS-1386 and MS-1373 respectively. Write Allis-Chalmers Construction Machinery Div., Milwaukee 1, Wis.

Power Sweepers for Cramped Quarters

91. How to gain the advantages and economies of power sweeping in numerous common smaller areas is the subject of these color-illustrated descriptive sheets. Ask for Bulletins 703-4-5- and 6 direct of Wayne Mfg. Co., 1201 E. Lexington St., Pomona, Calif., or just check our card-number.

Useful Attachments for "Payload" Tractor Shovels

95. Increased versatility for Hough "Payload" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc.

New Street Sweeper Broom Filament

157. Keystrand is its name, and full description of its contribution to better street sweeping is given in folder that also contains a sample of this new polypropylene filament. Write to Keystone Plastics Inc., 280 Badger Ave., Newark 8, N. J., for yours, or check our card-number.

For Prompt Service Use The Reply Card

International Wagner Heavy-Duty Loaders and Backhoes

195. International Wagner loaders and backhoes are matched with International utility tractors and are described in Catalog CR-1369-K available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card.

Don't Haul and Burn Brush, Dispose of It on the Spot

196. How you can do this the easiest way with Fitchburg Chippers is the theme of 16-page illustrated catalog that can save you work and grief. Gives experiences of others and describes simple mounting on truck body or on trailer, tractor or Jeep. Write Fitchburg Engineering Corp., Fitchburg, Mass., or just use reply card.

The Versatile Jeep

333. Inform yourself of its many varied uses and advantages with the new 4-page in-color folder showing the full line, with major specifications. Address R. J. Kreusser, Fleet Sales Manager, Willys Motors Inc., Toledo 1, Ohio, or use reply card.

"Guide to Cutting Truck Costs"

348. This is title of a 96-page book to aid truck owners in obtaining improved service and performance from any truck of any make or model. Covers everything from insurance to maximum gas mileage. Get your free copy from Truck Marketing Dept., Ford Motor Co., P. O. Box 608, Dearborn, Mich., or use our reply card.

Self-Propelled Ditchers of All Sizes

427. Information on the Vermeer line of self-propelled, one-man operated ditching machines. Years of experience in the light construction field. Model 524T digs 8 to 24 inches wide, 6 feet deep. The model 4T digs 6 to 14 inches wide, 4½ feet deep. Two new all-hydraulically-controlled ditchers. Model W-3 digs 3½ to 12 inches wide and 4 feet deep. Model W-1 compact size digs up to 6 inches wide and 40 inches deep. W-1 and W-3 available on rubber or crawler tracks. Model 3P fits on all tractors with standard 3-point hitch. For literature, check the reply card or write Vermeer Manufacturing Co., Pella, Iowa.

Monthly Time and Cost Record Book

249. To assist owners in determining the cost of owning and operating equipment Caterpillar Tractor Co., News Service, Peoria, Ill., has prepared a 24-page monthly time and cost record book. Twelve sets of pages are included on which to record day by day machine expenses for an entire year. Check the reply card for your copy.

Modern Compaction Methods and Equipment

411. This 52-page Manual covers modern day compaction methods and equipment, rubber-tire rolling, compaction of asphalt mixes, aspects of vibratory compaction, stage compaction on cohesive soils and compaction of asphaltic concrete surfaces. Check the reply card or write Road Machinery Div., Bros Inc., 1057 Tenth Ave., S. E., Minneapolis 14, Minn.

Warn Hubs for Selective Drive

450. Bulletin tells of their advantages for 4-wheel drive vehicles. Describes how you can switch to and from 2 and 4-wheel drive through medium of these hubs. Write for Catalog 60W to Warn Mfg. Co., Inc., Riverton Box 6064, Seattle 88, Wash., or use our card.

Tough Mowing Jobs Made Easy

546. . . . with the new extra-duty Jacobsen Ram Rotary mower. Cuts smooth on rough terrain. For full description of its versatility write for literature now. Address Jacobsen Mfg. Co., Dept. FW, Racine, Wis., or check the inquiry card.

Design Manual on Sectional Plate Pipes, Arches and Pipe-Arches

550. Size and weight tables, minimum gages for live load strutted and unstrutted, layout details and plan developments are some of the material covered in this manual. Write American Bridge Div., United States Steel Corp., 525 William Penn Place, Pittsburgh, Pa.

Complete Line of Asphalt Patching Mixers

586. Mixers capable of mixing 3 to 20 tons of hot mix per hour are described in literature available from McConaughay Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

Industrial Tractors and Equipment

625. In this very complete new, catalog you will find not only a full line of equipment descriptions but the full gamut of industrial applications such as digging, earth moving, mowing and snow removal, to name a few. Your copy is available from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or by checking our card number.

Design of Concrete Pavements For City Streets

657. Sections covered in this manual are classes of streets as to traffic, quality of concrete, working stress and safety factor, types of pavement design, design procedure, jointing of municipal pavements and use of distributed steel. Check the reply card or write Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

Transit Cranes for Bridge and Highway Building

691. Transit cranes that can lift 33,000 lbs. at 20-ft. radius, and 13,000 lbs. at 40-ft. radius with 60-ft. boom and outriggers set are described in literature from Bucyrus-Erie Co., South Milwaukee, Wisconsin. Also featured are load control, folding boom and boom lengths.

100 HP Motor Grader

715. Model 330-H features a constant-mesh transmission, 8 forward and 4 reverse speeds, full-diesel rubber-mounted engine. With hydraulic brakes, ample strength and weight, and a wide range of blade adjustments. Write for bulletin (Form No. M6-174) from LeTourneau-Westinghouse Company, Peoria, Illinois, or circle reply card.

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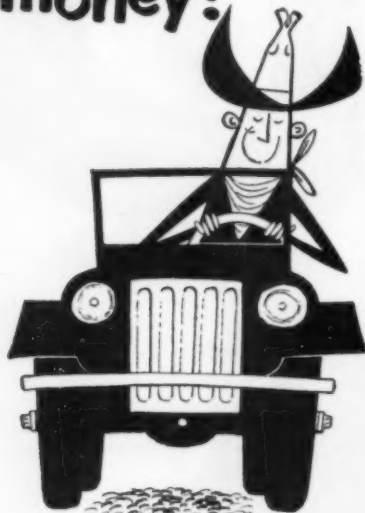
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WARN MFG. CO.
Riverton Box 6064-P
Seattle 88, Washington

To order these booklets check card opposite page 34.

WATER WORKS

Epoxy-Vinyl Protection for Steel Water Tanks

35. Three modern coating systems using "Nocoro" epoxies, vinyls and combinations for protection of steel water tanks are described by sample specifications in a brochure of Industrial Paint Co., Sewickley, Pa. Check inquiry card for your copy.

Handbook of Cast Iron Pipes and Fittings

32. Full engineering data on products of the Alabama Pipe Co., including Super De-Lavand cast iron pressure pipe and pipe fittings, valve boxes and other mechanical castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use in reference.

How to Select Right Angle Drives

42. Data-filled Catalog 31 & 32 of Johnson Gear & Mfg. Co., Ltd., 8th & Parker Sts., Berkeley 10, Calif., makes it easy to select the correct right-angle gear drive for deep well turbine and other vertical shaft pumps. Includes details on the Johnson "Redi-Torq" gear drive. To get your copy just check the reply card.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Use The Reply Card

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp., Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

A Comprehensive Handbook on Water Meter Settings

174. "The Engineering of Water Meter Settings" contains 34 pages of clearly illustrated data and specifications to help improve your practices and simplify your work. Every Water Department should have a copy of this valuable reference book. To get your address Ford Meter Box Co., Inc., Wabash, Indiana, or use the inquiry card.

The Design and Function of Elevated Steel Water Tanks

179. A 20-page bulletin of engineering information with illustrations of typical installations, emphasizing ellipsoidal, radial cone and spheroidal designs, may be obtained by writing Chicago Bridge and Iron Co., Advertising Dept., 332 South Michigan Ave., Chicago 4, Ill. or by checking the reply card.

Data Book For Engineers

199. New Link-Belt Catalog (No. 2617) includes all recent additions to their Water, Sewage and Industrial Waste treatment equipment. All designing engineers will want this one. Write Link-Belt Co., Colmar, Pa., or use the card.

U. S. Tyton Joint Pipe

210. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids is available. Tyton Joint cast iron pipe is provided with a simple, sturdy and tight slip-on type of joint. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

Bell and Spigot Joint Leaks Quickly Repaired

214. Broken water main can quickly be repaired when you have "Skinner-Seal" Split Coupling Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog GW now—this handsome 48-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. M. B. Skinner & Co., South Bend 21, Ind.

Cut Down Your Underground Explorations

276. . . for buried pipe by knowing where it is before you start digging for it. "Typical Pipe Detection Problems and Their Solution" is the title of a free 24-page illustrated, pocket-size book that tells you how to find and determine the depth of buried pipes, conduits, wires and cables. Address Tinker & Rasor, 417 Agostino Road, P.O. Box 281, San Gabriel, California, or check above number on our card.

Automatic Controls For Unattended Engines

278. To start and stop engines that are unattended. The multiple element itself gives six speeds and contacts. By adding a simple attachment 18 speeds are attained. Water, sewage and power plant heads will want Catalog 6 from Synchro-Start Products Inc., 8151 N. Ridgeway Ave., Skokie, Ill., or circle the card-number.

Clow Bell-Tite Cast Iron Pipe

280. Laying water mains is easier, faster and more economical with Clow Bell-Tite joint cast iron pipe. Joint employs a single rubber gasket as the only accessory. Complete details available in illustrated literature from James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Do You Know the Value of the V-Notch?

295. A new booklet tells what you want to know about how chlorine feeding can be made as regular and precise as the sunrise. Ask for "The V-Notch Story" direct of Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J., or check the card-number.

Information on Boring Machines

343. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.

Manual Answers Your Water Meter Questions

440. This valuable reference covers the complete line of Trident water meters, giving full descriptions of each type and providing also helpful background information on metering and its advantages. Get your copy of the 28-page Trident Water Meter Catalog, Form 421-1, by checking the reply card or write to Neptune Meter Co., 47-25 34th St., Long Island City 1, L.I., N.Y.



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Thousands of leading American companies keep their investment at a minimum with a 'Jeep' fleet. Great versatility and low initial cost give you the most versatile vehicle you can possibly get for your money! Traditionally rugged 'Jeep' construction keeps maintenance costs low and the resale value high. Get in touch with us today for complete information! Write to: Robert J. Kreusser, Fleet Sales Manager, Willys Motors, Inc., Toledo 1, Ohio.

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Willys Motors, Inc., Toledo 1, Ohio. One of the growing Kaiser Industries.

To order these helpful booklets check the reply card opposite page 34.

Helpful Information on Elevated Steel Tanks

485. Factors to be considered in the selection of elevated steel tanks plus capacities, dimensions and particulars of many attractive designs are provided in 20-page Bulletin 101 of Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh 25, Pa. Use inquiry card to get your copy.

Kohler Stand-by Units Protection Against Power Failures

602. Dependable Kohler electric plants provide uninterrupted power for vital services when regular sources fail. Kohler Electric Plants World-Wide, folder E-402, illustrates models available for stand-by, sole supply, portable and marine applications. Sizes from 500 watt to 115 kw, gasoline, gas or Diesel operation. Write Kohler Co., Kohler, Wisconsin, or use the reply card.

Air Control Valves For All Types of Pipelines

620. Literature on Crispin Air Valves, which safely control air in lines handling liquids, to maintain efficient operation and prevent expensive failures, is available from Multiplex Manufacturing Company, Dept. C, Berwick, Pa. Write today for your copy of the Crispin Air Valve Catalog, which offers complete information on the full line of dependable Crispin Air Valves.

Bulletin Covers Step-by-Step Action on the Water Problem

689. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Thos. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois.

To Insert Valves Under Pressure . . .

555. . . let your first step be review of this "step-by-step" folder on Mueller tapping and cutting-in sleeves and valves. Write Mueller Co., Decatur, Ill., for Form W-8899 or circle number on our card.

Ball Joint Pipe for River Crossings

562. And other tough pipe-laying situations are theme of this well-illustrated booklet on MOLOX joint pipe. Contains map showing various locations of such installations, with suggestions for use and methods of assembly. Complete data on all diameters. For your copy, write American Cast Iron Pipe Co., Box 2603, Birmingham 2, Ala., or circle our card-number.

Commentary on

Water and Sewage Treatment

629. This valuable 76-page booklet is made up of reprints of the articles on the subject by R. S. Rankin and published over a period of two years in PUBLIC WORKS. Your free copy may be had from Dorr-Oliver, Inc., Havemeyer Lane, Stamford Conn. Use the reply card.

For Pipe Pushing and Pulling, Cut Costs and Time

641. New folder describes continuous-motion machine that eliminates all resetting of grip. Hand or air powered for pipe 3/4 to 2 inches. Write for new folder to The Trojan Mfg. Co., 1112 Race Drive, Troy, Ohio or use our reply card.

STREET LIGHTING AND TRAFFIC CONTROL

Aluminum Traffic Control Devices

32. Is title of 24-page booklet covering every such device made of aluminum, from signs and sign blanks to panels, overhead structures and paint. Full specifications. For yours, just write Aluminum Co. of America, Alcoa Bldg., Pittsburgh 19, Pa., or use reply card.

Steel and Aluminum Lighting Poles for Streets and Highways

74. Standard designs, assembly details, suggested pole sizes and base construction details are some of the information offered in Bulletin LS-29 (Steel) and Bulletin LS-30 (Aluminum). Check the reply card or write The Union Metal Mfg. Co., 1432 Maple Ave., NE., Canton 5, Ohio, for details covering the latest Monotube pole designs for modern streets and highways.

Complete Catalog on Traffic Control Equipment

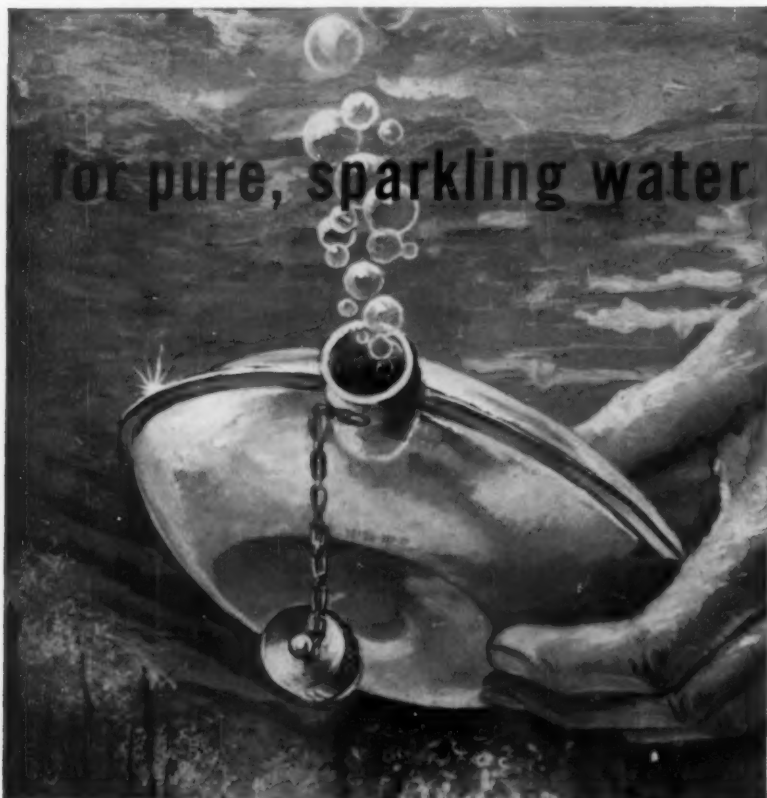
240. All types of controllers, PR system of coordinated traffic control, vehicle detectors, timers, vehicle counters and radar speed meters are covered in catalog available from Automatic Signal Div., Eastern Industries Inc., Norwalk, Conn. Check the reply card.

Manual on All Types of Traffic Signs

379. This 26-page manual covers regulatory, warning, school, railroad, street name, road construction, route markers, miscellaneous signs and plastic reflectors. Check the reply card or write The Miro-Flex Co., Inc., 1824 East Second St., Wichita 14, Kans.

Lighting Standard Equipment

704. Included in these two catalogs, Octagonal Tapered Steel and Aluminum (No. 0-1-860) and Aluminum Round Tapered (R-1-10-60), are new designs in both street and area lighting standard equipment with a good variety of arms to meet most any lighting problem. Traffic Signal Standards and Brackets and Mast Arms for wood, metal pole and wall mounting are included in the Round Aluminum catalog. Write to Kerrigan Iron Works Company, Eleventh & Herman Street, Nashville 2, Tenn., or circle reply card.



TRIANGLE BRAND COPPER SULFATE

Small, economical dosages of Triangle Brand Copper Sulfate will make your water supply palatable. It destroys algae and aquatic weeds that cause bad water odors and give water an unsavory taste. ■ Another important use of Triangle Brand Copper Sulfate is for the control of root growths, fungi and slime in sanitary sewers and storm drains without damaging trees and shrubs. ■ Write today for complete information on the use of Triangle Brand Copper Sulfate in water supply systems, sewers and drains.



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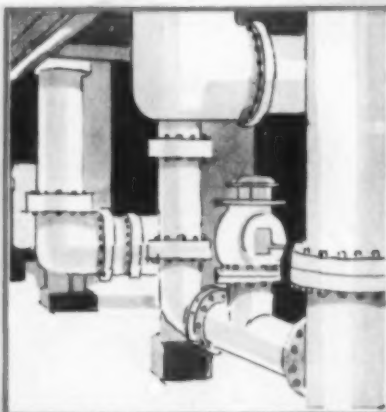
PIPE FACTS

In a recent survey, ten times as many contractors claimed more difficulty (breakage during installation) with composition pipe than with cast iron pipe.



DO YOU KNOW that where electrical thawing of mains and services is necessary, AMERICAN Fastite pipe can be installed with a specially designed and patented conductive gasket? This remains effective regardless of expansion, contraction or future movement of the joint.

DO YOU KNOW that the cost of replacing or repairing a broken pipe line can amount to many times the original cost of the pipe? Inconvenience to residents and merchants can also be costly. Initial pipe costs don't tell the whole story. Why gamble? Install time-tested cast iron pipe with "built-in" safety factors.



DO YOU KNOW that over a million pounds of AMERICAN pipe and fittings in the modern sewage treatment plant at South Bend, Indiana, helped this city to solve a serious river pollution problem? AMERICAN offers a complete line of piping to meet water, sewage treatment and industrial plant service.

DO YOU KNOW that every \$4.50 invested in Otis Elevator stock in 1932 would now be worth approximately \$89.00? Another sure long-term investment is dependable cast iron pipe. Utilities in 96 cities throughout the United States have cast iron pipe mains which have been in service for more than 100 years.



AMERICAN CAST IRON PIPE COMPANY
BIRMINGHAM ALABAMA

To order these helpful booklets check the reply card opposite page 34.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 208 So. Broad St., Ridgewood, N. J. Check the reply card.

Catalog on Synchronous Motors and Controls

64. A 27-page Catalog B-7292 on synchronous motors and controls is well illustrated and contains motor selector charts, application data, and formulas for calculating power factor. For a copy write Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., or check the reply card.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Gratings for Sewage, Water and Lighting Plants

217. Aluminum or welded steel gratings and treads, according to your needs, are well described and illustrated in literature to help you design, specify and select. Write for file No. AIA 14-R to Grating Division, Rockwell-Standard Corporation, 4000 East 7th Avenue, Gary, Indiana, or check the inquiry card today.

Stationary Diesels For Water and Sewage Plants

167. Engines are four-cycle, 6 or 8 cylinder, in-line models, ranging from 190 to 2150 bhp and from 135 to 1500 KW, are available either naturally aspirated or supercharged, and can be furnished to run as diesel, dual-fuel or gas engines. For Bulletin #115A check the reply card or write White Diesel Engine Div., The White Motor Co., Springfield, Ohio.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check reply card for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Md.

Package Sewage Plants for 50—5000 Population

181. Design information on Walker "Spar-jair" package sewage treatment plants for sizes from 50 to 5000 population equivalent is presented in a 12-page bulletin, No. 19-S-94. Typical plans and sections, special design considerations, specifications and a discussion of the "how" and "why" of the contact stabilization process are included. Check the inquiry card or write Walker Process Equipment, Inc., 840 No. Russell, Aurora, Ill.

Rubber Joints for All Types of Concrete Pipe

205. . . . are described and their advantages outlined in a new Engineering Manual which engineers in particular, will find valuable with respect to physical properties and performance characteristics of rubber compounds used in such joints. Plenty of on-the-job illustrations of value to contractors and all pipe-layers. Address Hamilton Kent Mfg. Co., 427 W. Grant St., Kent, Ohio, or check our card-number.

Valves for Concrete Pipe

208. And no adapters needed. That is the title and the message of this new illustrated brochure in color covering this specific problem in using this type of pipe. Double disc valves with O-Ring joints are fully discussed. Get Circular No. 26 from M & H Valve & Fittings Co., Anniston, Ala., or use our reply card.

How to Save \$264 per Mile

216. . . . in sewer cleaning is the gist of a new 8-page brochure that discusses just how such savings can be accomplished. It costs nothing to find out and it may be your best investment of the day. Write for it to Flexible, Inc., 415 South Zanga Blvd., Dallas 8, Texas, or circle the card-number herewith.

Many Fuels Will

Power Enterprise Engines

395. New bulletin tells of economies and advantages of the Enterprise Engine "Dual Fuel" system. Ideal for stationary power plants, sewage treatment plants, and pumping stations. Address Enterprise Engine & Machinery Co., P.O. Box 2161, 550 85th Ave., Oakland 21, Calif.

Users of Transite Pressure Pipe

403. . . . will welcome a new, revised edition of the "Installation Guide for Transite Pressure Pipe," just published. Covers all operations from trenching to final assembly, service connections, backfilling, tamping and testing. Order your copy of 124-page TR-62A from Johns-Manville, 22 East 40th St., New York 16, N. Y., or check our card.

Sewage Treatment

Engineering Data Manual

511. This manual contains a brief outline of the various accepted methods of treating sewage and some of the problems, advantages and disadvantages of each. Check the reply card or write Smith & Loveless, Inc., Division—Union Tank Car Co., Lenexa, Kansas for design notes, charts and drawings.



Snow removal is faster, more efficient with Monarch Power Hydraulic Controls on your vehicle. Lift and lower your snow plow right from the cab with a flick of the wrist. Instant up-and-down action . . . automatically! Quick installation. Thousands in use nationwide. See your dealer today. Free folder sent on request.

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FULL AUTOMATIC ENGINE CONTROLS

FOR GASOLINE DIESEL & GAS ENGINES



Synchro-Start's new protective engine controls have been designed, for the starting and stopping of engines from remote pilot devices, such as pressure switches, float switches, power failure relays, etc., and are completely automatic in operation.

These dependable controls are encased in a steel, dust proof cabinet, and now feature enclosed PLUG-IN RELAYS as well as OVERLOAD BREAKERS. The plug-in relays simplify what little field maintenance that may have been required in older models, while the overload breakers eliminate the necessity of replacing fuses.

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*world's largest line of hydraulic
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549. . . . for water and sewage service, in sizes 2 through 8 inches, made of epoxy resins and glass, highly resistant to hydrogen sulfide gas, electrolysis and difficult soil conditions. Booklet tells all in 16 illustrated pages. For your copy write Amercoat Corporation, 4809 Firestone Blvd., South Gate, Calif., or circle number on the card.

Judging Engine Quality

565. . . . may be hard but this 26-page booklet emphasizes the features of various designs which provide you with top engine performance for minimum cost—original and or final. Cutaway illustrations compare these features for quick grasp of their importance. Write for Form 20185-DN935 to Caterpillar Engine Div., Peoria, Ill., or just check off our card-number.

Controls For Use in Pumping Stations and Sewage Plants

662. Single and multi-pump sump controls, pressure operated for use in pumping stations and sewage disposal plants are described in literature available from Healy-Ruff Co., Water Level Controls Div., 2255 University Ave., St. Paul 14, Minn. The two principal types of pressure operated sump controls are covered along with general descriptions and features

Reinforced Concrete Pipe For Culverts and Sewers

672. Elliptical Lo-Hed and Hi-Hed pipes, round pipe and flat base pipe are described fully in literature from American-Marietta Co., Concrete Products Div., 101 East Ontario St., Chicago 11, Ill. Headwall details, discharge curves, hydraulic capacity tables and hydraulic properties are included. Check the reply card.

Literature on Concrete Sewers

270. Literature on concrete sewers is available from Portland Cement Association, Dept. 10-89, 33 West Grand Ave., Chicago 10, Ill. Check the reply card for data on concrete for all modern sewers.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135A describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Bitumastic For Lasting Protection Against Corrosion

570. Bitumastic protective coatings prevent corrosion of metal and deterioration of concrete and masonry and are fully covered in catalog from Koppers Co., Inc., Tar Products Div., Pittsburgh 19, Pa.



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CONSTRUCTION EQUIPMENT AND MATERIALS

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97. A complete profusely illustrated catalog covering use of prestressed concrete as a construction material for bridges, pressure pipe, tanks, and many other public works applications. Gives specifying data, too. Address American Steel & Wire Div., U. S. Steel Corp., Rockefeller Bldg., Cleveland 13, Ohio.

"Low Bid? Best Buy?"

144. Don't miss this penetrating analysis of the "Low Bid" fallacy, put out in tabloid form with some thought-provoking case histories included. Have this presentation of bid facts before your next letting. Ask for Form D111 from Caterpillar Tractor Co., Peoria, Ill.

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272. You walk with it and it clocks off feet and inches like an automobile speedometer. Circular describing its many public works uses and full details available on request from B. G. Reilly Co., Box 231, North Scituate, R. I. or by using our reply card.

Gradall Does Too Many Jobs To Classify Them

340. The best way to learn how many places and in how many ways the Gradall earth moving and construction machine can speed work and save money for you is by writing for brochure M-2460. You get it from The Warner & Swasey Co., Const. Equipment Div., 5701 Carnegie Ave., Cleveland 3, Ohio, or by circling above card-number.

Selection of a Small Packaged Air Compressor

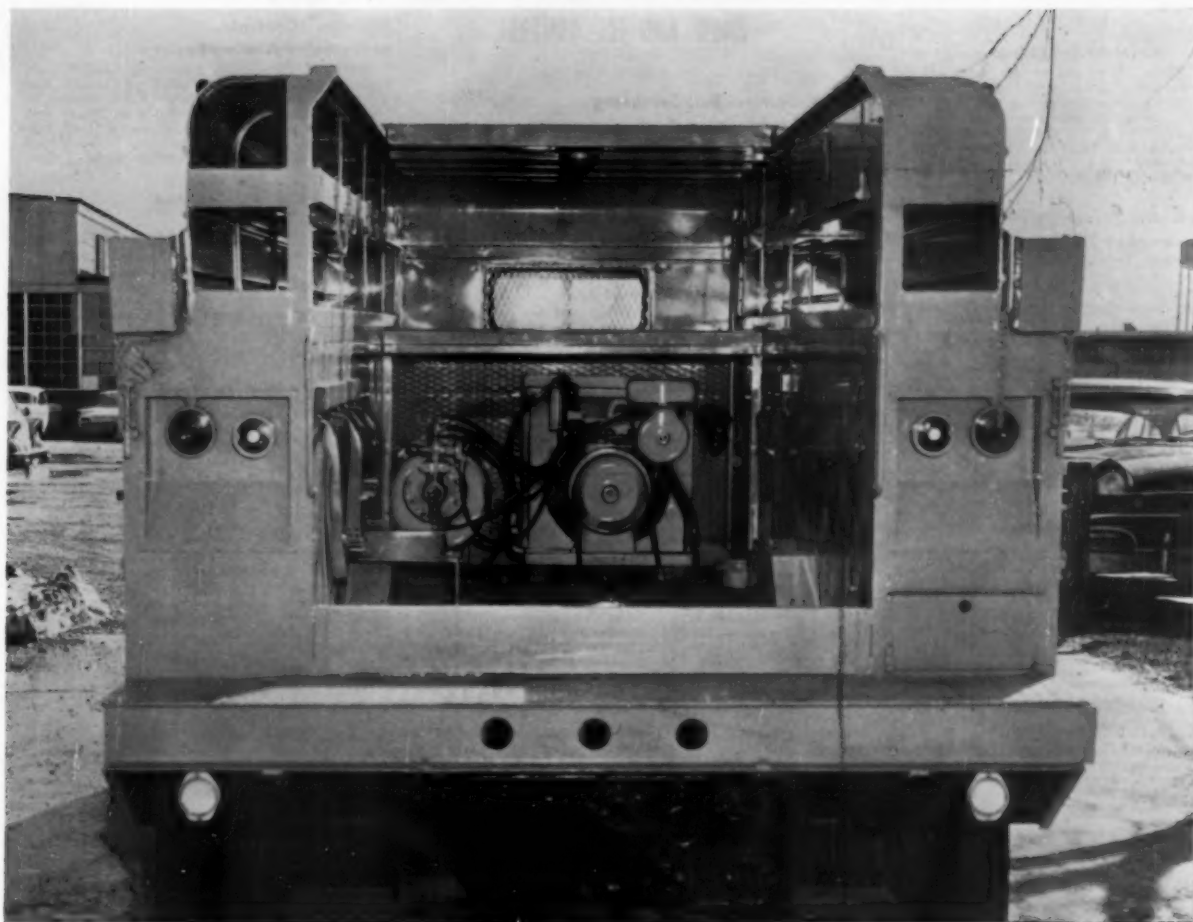
387. Catalog 1548 contains tabular and chart information on cu. ft. of air required to operate a variety of pneumatic equipment, average and continuous air supply tables and charts on ratios of compression and tables on flow of air through orifices. Check the reply card or write Ingersoll-Rand Co., News Service Dept., Phillipsburg, N. J.

Construction Materials Tested

418. This is the title of a new 6-page general bulletin illustrating and describing briefly a complete line of testing machines and collateral apparatus for concrete, concrete products, reinforcing bars and aggregates. Write for it by above name to Forney's Inc., Tester Div., Box 310, New Castle Pa., or check our card-number.

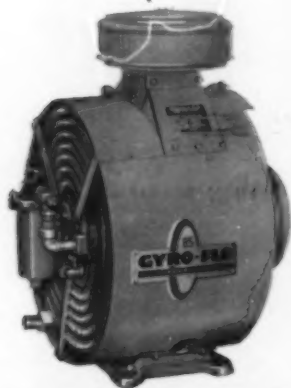
Big Tractor-Powered Equipment

540. Including tractor shovels, dozers, scrapers, loggers and special equipment models and features illustrated and described in attractive brochure available from Clark Equipment Co., Construction Machinery Div., Benton Harbor, Mich. Or just check number on our card for us to order for you.



125-cfm power-take-off Gyro-Flo mounted behind cab of a utility truck.

Why you save truck space and cut costs when you
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85-cfm power-take-off Gyro-Flo takes only 21½" by 24" of floor space.

Your truck engine supplies the mechanical power...the Gyro-Flo converts it to Air Power. The super-compact design of the Gyro-Flo power-take-off compressors leaves more truck space for other equipment. But there's no compromise with Gyro-Flo's traditional quality and performance-proved *dependability*.

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290A2 11 Broadway, New York 4, N. Y.



The World's Most Comprehensive Compressor Experience

PUBLIC WORKS for December, 1961

To order these helpful booklets check the reply card opposite page 34.

One Unit;

Four Different Machines

392. Operators of the International Drott 4-in-1 Skid Shovel have four different machines at their fingertips, ready for use as a bulldozer, scraper, skid-shovel and clamshell. To review these varied services and many exclusive features get Bulletin CR-600-L. International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois.

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On Jeeps or Tractors

504. "Gear-Draulic" boom-type trenching attachments by Auburn mount on tractor or Jeep, give new utility to your equipment. Get descriptive brochures from Auburn Machine Works, Inc., Auburn, Nebraska. Use the inquiry card.

For Better Work All Over Town

525. Put a Bantam in your life. On trenching, excavating, street and highway work this handy versatile crane-excavator obviates using larger equipment in many cases. Saves time and dollars. Get descriptive literature from Schield Bantam Co., 301 Park St., Waverly, Iowa or circle card-number.

Public Works Equipment for Everyday Use

578. How many everyday public works needs can be met by the products of one company is the basic content of this brief but informative brochure. Inform yourself with a copy of it. Address Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wisc., or ring the number on card herewith.

Specification Sheets on John Deere Tractors and Equipment

588. Information and specifications on the John Deere crawler and wheel-type industrial tractors and working equipment. Deere & Co., Industrial Division, Moline, Ill. Check the reply card. State type of tractor and equipment.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Bare Pavement Maintenance With Sterling Rock Salt

158. Handbook is designed for road maintenance men who are responsible for safe winter pavements; and is a safe-roads fact book about a modern snow and ice removal program. Check the reply card or write International Salt Co. Inc., Clarke Summit, Pa.

Use The Reply Card

Save on Winter Ice Control Cost

237. . . . with the faster-working salt described in this new Bulletin B-1159S. Tells what this salt will do and why, and where to get it. Also the bonus you get from using salt for summer road stabilization projects. Address Morton Salt Co., Industrial Div., 110 N. Wacker Drive, Chicago 6, Ill., or use our card.

Snow Plows For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Snow Plows, Inc., Clayton, N.Y.

Hydraulic Controls

Make Snow Plowing Easier

368. Hydraulically operated power controls may be readily installed on trucks that will plow snow this winter. Start preparing now to make winter maintenance an easier job. Get illustrated folder from Monarch Road Machinery Co., 1331 Michigan St., N.E., Grand Rapids 3, Mich. Use the inquiry card.

Winter Road Maintenance With Calcium Chloride

386. This bulletin contains data on why calcium chloride mixtures work better, how and in what percentages to store, mixing methods and recommendations for various storm conditions. Check the reply card or write Columbia Southern Chemical Corp., One Gateway Center, Pittsburgh 22, Pa., for your copy.

No Idle Trucks with these Spreaders

397. New 8-page catalog gives features, specifications, users' statements on the Fox Mountable spreaders, equally good for sand, cinders, chips, salt, calcium chloride. Designed for one-man operation and year-round use. Wide widths and high speeds. Mounts or demounts in 15 minutes. Write Fox River Tractor Co., Box 469, Appleton, Wisc., or check our card number.

How to Make

Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and direction for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Snow Plows For Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of up to 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.



for Fast, Efficient Spreading of Bulk Chemicals for snow and ice control.

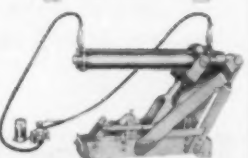
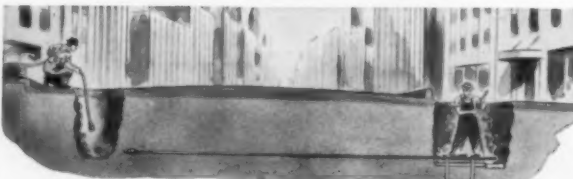
This is your most Economical unit. You save: by lower initial cost; by using less material; by lower maintenance costs.

"Scotchman" Spreader, Model SS7V3, gives you one-man, cab control. Blows salt on in wide, "bird-shot" melting pattern . . . you use less salt. The dump body mounted "Watchman Hopper" . . . either 3 cu. yd. or 5 cu. yd. . . gravity-feeds salt to spreader, without running with elevated body

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MODEL B AIR POWERED
for ¾" to 2" pipe

Exclusive continuous action, which eliminates all resetting of grip, does the trick!

The Trojan combines pushing and pulling operations in one machine—eliminates all time-killing resetting of grip—keeps pipe continuously moving. Does the job at lower cost—in far less time.

Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible. Is also available for ¾" pipe.

Model B (manual, hydraulic or air powered) needs only a 6' trench—has 3 speeds for different soils—is reversible in 30 seconds. Push pipe comes in 30" lengths, assures straight travel.

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performance **HIGH**
operating costs **LOW**

Available in many types for usual and unusual services, Darling Hydrants provide that dependability, ease of operation, and minimum maintenance that keeps overall costs *low*, performance *high*!

The B-50-B design, for example, combines ball bearing operation with "O" ring seals—assures a trouble-free, easily operated, dry-top hydrant. Threads and bearings stay lubricated—water can't reach them. There's no packing gland maintenance—ever! And the B-50-B design is available in all types except the Tropical. *You can depend on Darling Hydrants for maintenance-free, trustworthy service.*

Write for Bulletin 5710 or ask a Darling engineer for proposals.

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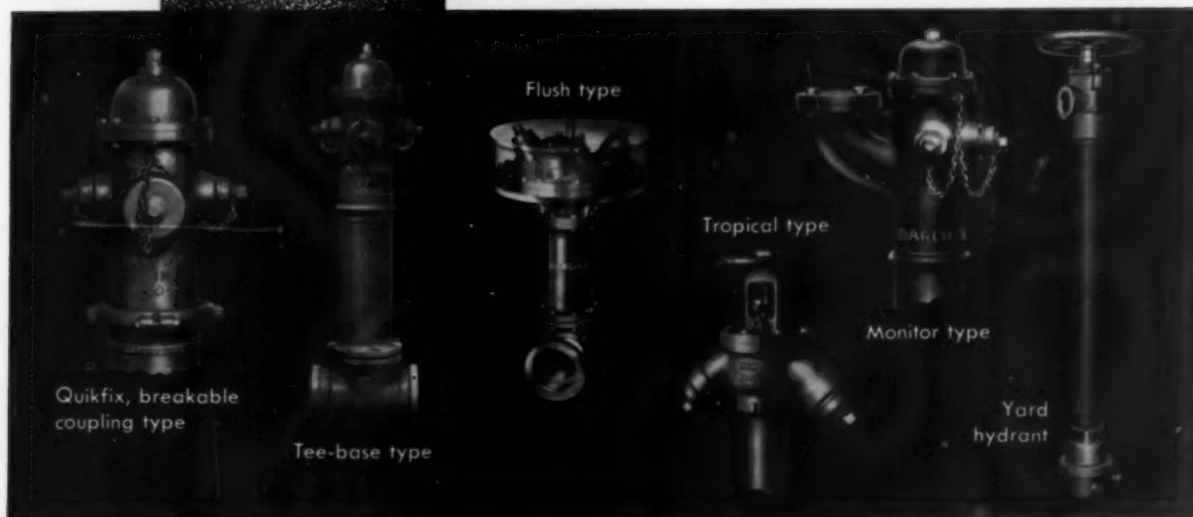
*The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ontario, Canada
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Count the when your

Get "carry-type scraper" stripping, excavating, and grading action—to strip sod, shape and grade streets, playing fields, parking lots, recreation areas. Here a TD-9 Four-in-One is stripping sod, with typical inch-close accuracy. You can position the cutting edge to "boil in" materials just like the big scrapers, and work in close quarters where they can't!



Get positive, clam-type bottom dumping that permits handling sticky, non-scouring materials that stop old-style buckets cold! It's the same principle dredging contractors use on muck and gumbo—opening the clam pulls material from bucket surfaces; gravity down-pull assures prompt self-cleanout!



You convert the 4-in-1 into a full-size, full-capacity, depth-controlled bulldozer—with the same finger-tip ease of getting all its other machine actions! Simply open the clam, set "blade" segment to cut, and roll the earth just like a specialized moldboard! The TD-9 rig is backfilling new sewer line installation—works in winter removing snow, and loading out ice-control materials!



Get power-shovel-like break-out force—to do work like old pavement removal or land clearing. This 3-cu. yd. TD-20 Four-in-One, for instance, can apply 43,000 pounds of pry-over-shoe break-out—to dig up and load out old multi-layered asphalt pavement that's up to one foot thick. Then this same machine roughs out new Seattle street and curb grades and completes the subgrade, unaided!

rigs you won't need or miss... clam-action 4-in-1 takes over!



▲ Get "equipment spread" utility—get efficiency no other single machine can duplicate on sanitary landfill waste disposal. Only the 4-in-1 gives the "biting" and controlled dozing actions to spread refuse in uniform layers. Only the 4-in-1 gives compactor plate "ironing-down" action, to "squash" the refuse for complete, odor-free covering. And only the 4-in-1 gives "carry-type scraper" controlled spreading (see photo) to put down "cover" uniformly on-the-go! The TD-15 Four-in-One, shown here, keeps Williamsport, Pennsylvania's landfill sanitary, at minimum cost!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin



INTERNATIONAL
DROTT

Count the money-saving applications that 4-in-1's show here. Count the machines you won't need or miss when a 4-in-1 "takes over." Then total the big savings you'll make on first price and operating costs. And size-up how many more big-ticket, limited-duty rigs the 4-in-1 can replace—in addition to the ones indicated here! Let your International Drott Distributor demonstrate!

"A 5% saving in operating cost plus higher resale value is why we're buying Ford Trucks exclusively"

says James Lafferty, Transportation Manager for Henkels & McCoy, Inc., Philadelphia, Pennsylvania

"We ran a six-month comparative test on six Ford Trucks against six equivalent competitive models and found that the Ford Truck operating costs consistently ran 5% less than the others. Also, the increasing popularity of Fords with truck users means that we invariably pick up an extra \$100 to \$200 at resale time.

"Our company has 441 Ford Trucks operating from one end of the country to the other. Less than 20% of our fleet is within practical traveling distance of our two maintenance depots, so we depend on local Ford Dealers for the bulk of our service work. The complete network of Ford Dealers—even in remotest areas—provides unparalleled service everywhere.

"We specialize in handling construction and maintenance jobs. For example, we maintain utility lines, telephone lines, gas pipelines, and put in city and shopping center lighting systems. On these jobs, our trucks usually have to make their own way, road or no road. We use Ford F-250 4-wheel drive pickups in transporting crews to construction sites and F-600's to handle telephone line or pipeline construction, while our T-750 Tandem Axle trucks are equipped with a boring unit to dig 11-foot-deep holes for powerline transmission poles.

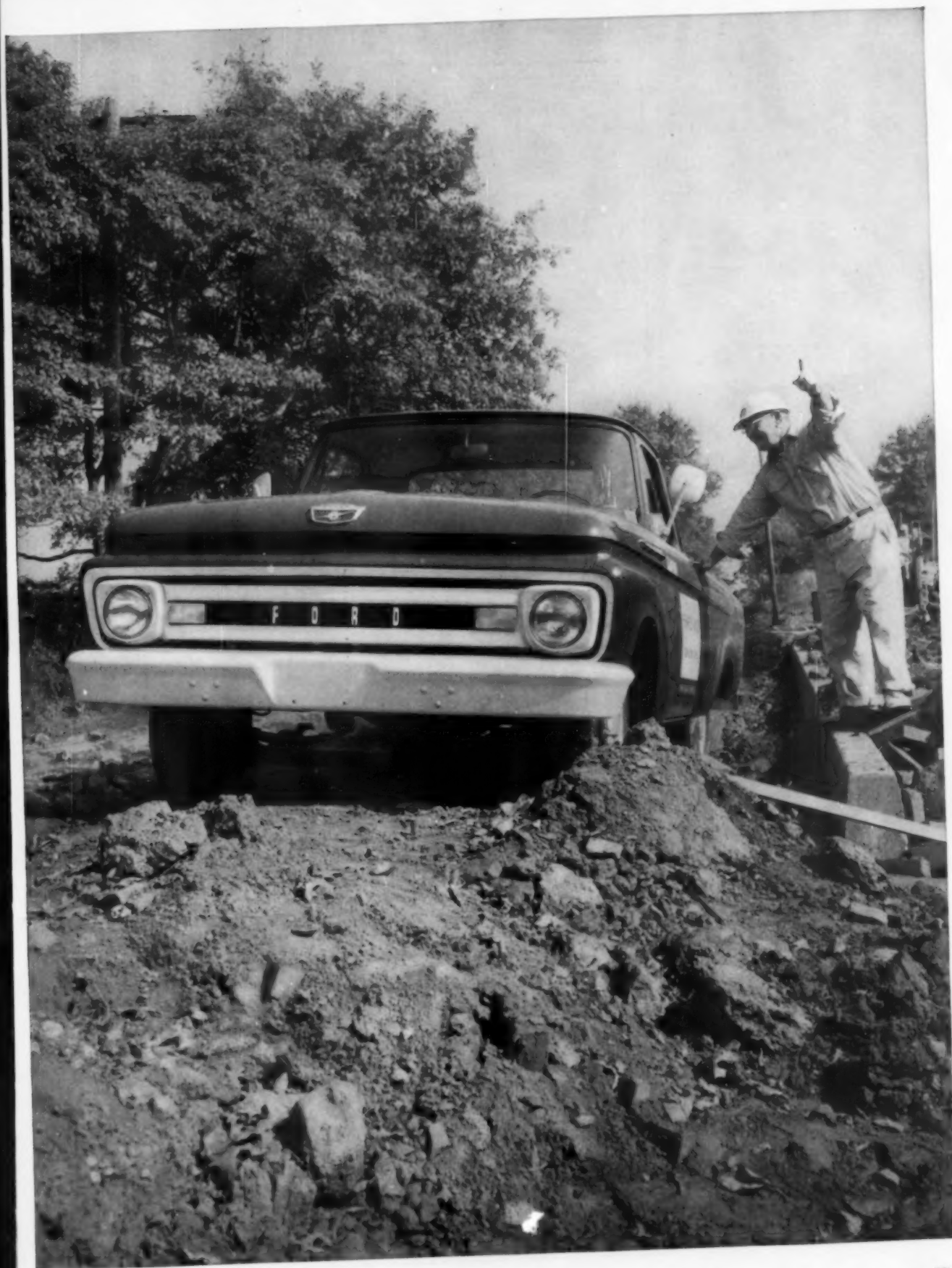
"Ford's rugged dependability, universal adaptability and superior economy keep us buying Ford Trucks exclusively."

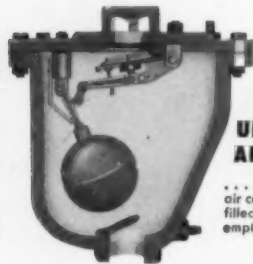
Solid testimony that Ford's full-time economy only starts with low price!

FORD TRUCKS COST LESS



PRODUCTS OF  MOTOR COMPANY





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AIR VALVES**

... positive, full-time
air control when line is
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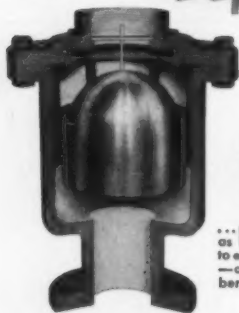
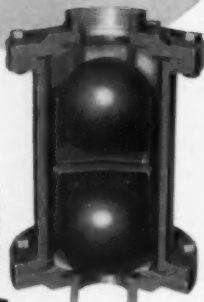
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AIR CONTROL Valves

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... release air semi-
automatically from
pipeline siphons to
end danger of throttled
pipeline — available
with either metal or
rubber float.



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... permit air to escape
as line fills, allow air
to enter as line empties
— available with rub-
ber or metal float.

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Icy Sidewalks

Scott v. Village of Olivia, 110 N. W. 2d 21, a Minnesota case decided June 23, 1961, was an action by a husband and wife against a village and the tenant of a bowling alley located within the village, for injuries suffered by the wife in a fall on an icy sidewalk in front of the building.

At the northeast corner of the building is a downspout which drains water from a rain gutter running along the north edge of the building. This downspout discharges water along the ground at the northeast corner of the building, a few feet from the sidewalk. From that point there is a slight downgrade in an easterly direction which carries the water onto the sidewalk where it accumulates and freezes.

An employee of the operator of the bowling alley tried to chip the ice away at 4 P.M. of the day when Mrs. Scott was injured. He testified, however, that water was still accumulating and freezing at that time. He did not sand the walk. A neighbor testified that this type of situation had continued over a period of thirteen years. She testified that during periods of thawing there was always ice on the sidewalk at this spot.

At the close of the evidence, the trial court granted a directed verdict for the village, on the ground that the ice on the sidewalk had not existed for a sufficient length of time to give the village constructive notice of the condition and that there was no actual notice. A directed verdict was also granted in favor of the operator of the bowling alley, on the ground that the condition was not shown to be created or aggravated by him.

On appeal to the Supreme Court of Minnesota, it was held that it was error to direct a verdict in favor of

the village, that the evidence required submission of the case to the jury on the questions of whether the village was chargeable with constructive notice of the hazardous condition and was negligent in failing to abate the nuisance.

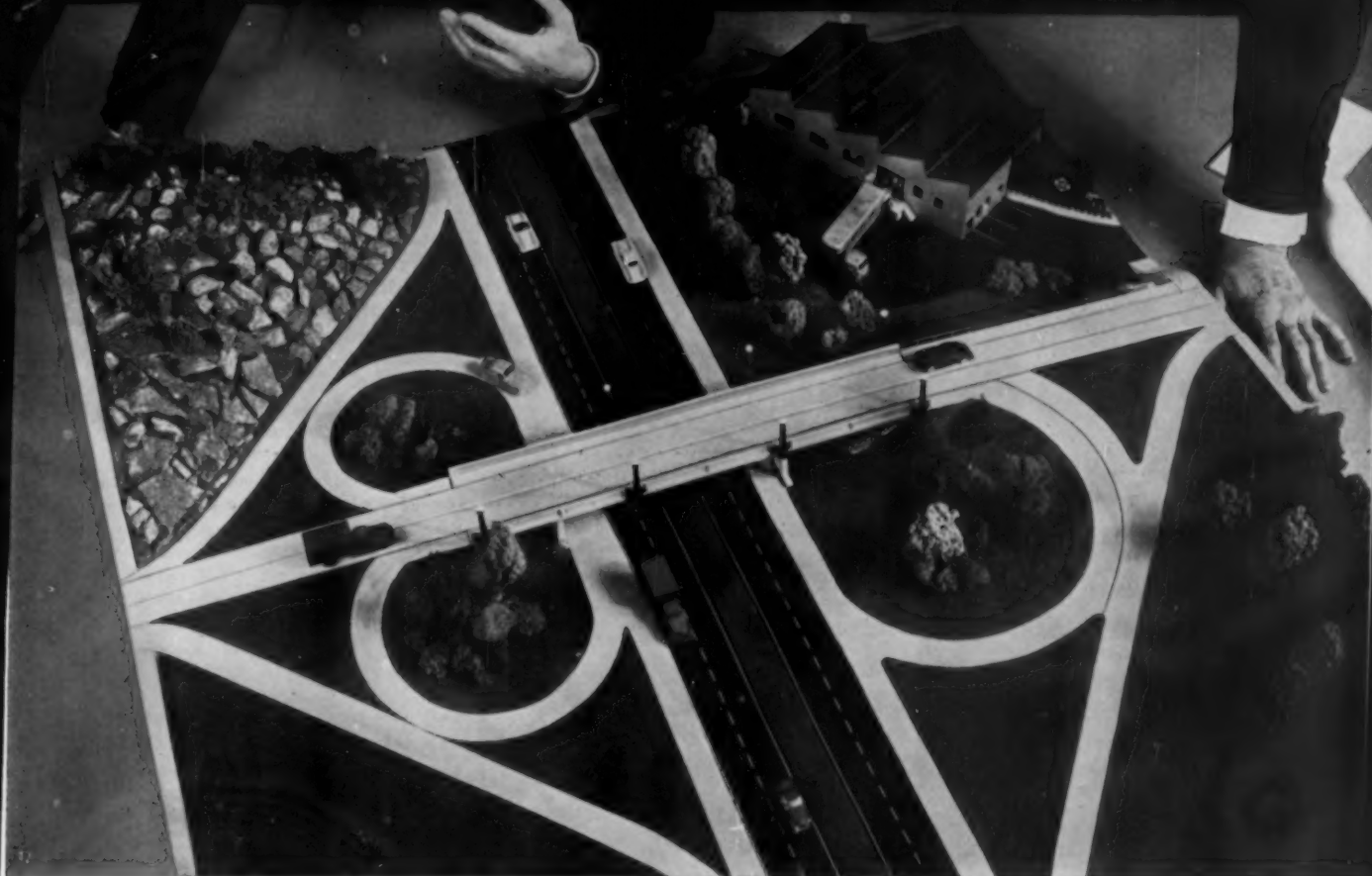
Earth Moving Contract

Christensen v. Iowa State Highway Commission, 110 N.W. 2d 573, an Iowa case decided Sept. 19, 1961, was a suit on an oral contract to recover for moving earth on a highway project.

Schroeder and Van Buskirk were principal contractors to construct part of Interstate Highway 29 in Harrison and Pottawattamie counties. They subcontracted in writing to Smith part of the earth moving and grading. He was to be paid "59 cents per cubic yard of dirt moved to grade . . . to be measured by embankment quantities. . . . Final quantities . . . to be determined by said State Highway Commission."

On September 20, 1957, the time for Smith to perform his subcontract had expired and the work was not completed. He then orally engaged plaintiffs Charles and Mark Christensen, doing business as Christie Brothers, to haul dirt in trucks to bring at least part of the new road to grade. Plaintiffs offered to move this dirt for 45 cents per cubic yard but Smith agreed to pay 50 cents. Plaintiffs claim the 50 cents was to be paid for each cubic yard of dirt hauled. Smith, however, contends plaintiffs were to be paid 50 cents per cubic yard of embankment quantities in place, just as he was to be paid at the rate of 59 cents per cubic yard for such quantities. This is the main dispute between the parties.

There is a good deal of shrink in loose dirt hauled in a truck after it has been deposited on a road grade and becomes more compact. Mark



When it comes time to appoint a trustee or fiscal agent for revenue bonds, The Chase Manhattan Bank is at the service of state, county and municipal authorities. Chase Manhattan has the staff and experience to handle this function as trustee or fiscal agent in cooperation with banks in the areas where the projects are located. For complete details write: Corporate Trust Division, The Chase Manhattan Bank, 1 Chase Manhattan Plaza, New York 15.

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"Third-cylinder" bucket action . . . a step beyond ordinary rollback . . . makes it easy as "falling off a log" to come up with a full bucket. And you do it time after time . . . putting up to 50 percent more material in the truck every cycle.

SHUTTLE Clutch lets you move into the pile fast, reverse swiftly and swing up to the truck . . . every movement controlled, continuous, accurate. No foot clutching or gear shifting.

Full loads in the 1-yard bucket are carried over the big wheels. Tires roll easily over rough terrain. There's flotation and capacity for big loads.

IT DOESN'T COST TO FIND OUT why this D-15 is the outstanding loose material unit. Call your Allis-Chalmers dealer or write Allis-Chalmers Mfg. Co., Utility Tractors and Equipment, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

SHUTTLE Clutch is available on the D-15 and the new H-3 and HD-3 crawlers.

Christensen estimates 25 per cent as the amount of such shrink on this job. Other estimates are higher. Thus the principal controversy is whether plaintiffs are to be paid for the quantity of dirt hauled without deduction for this shrink.

The trial court upheld plaintiffs' version of the method of computing the quantity for which Smith was to pay 50 cents per cubic yard and found plaintiffs hauled a total of 35,508 yards, the quantity claimed by them.

Defendant's method of computing "embankment quantities in place" was to bore holes at intervals on the grade, measure their depth and compute the yardage from the measurements. There is evidence that plaintiffs took part in, or witnessed, along with defendant, boring and measuring of holes on this grade after plaintiffs did their last hauling. After considerable discussion the parties were unable to agree on the quantity of dirt, computed by this method, that plaintiffs hauled onto the embankment and was there in place.

On appeal, the court held that the fact plaintiffs took part in the measurements and computations and discussed settlement on the basis of quantities in place lends support to defendant's version of the agreement. If plaintiffs were to be paid on the basis of loose dirt hauled, they would naturally have little, if any, interest in the quantities in place on the embankment. This evidence tends to show the practical construction plaintiffs by their conduct placed upon the agreement. The court finally held that plaintiffs were entitled to be paid only for 26,000 yards of dirt, based substantially on embankment quantities, instead of the 35,508 yards claimed.

• • •

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*Permits easier, quicker,
permanent repair of
4", 6" & 8" transverse
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underground breaks*

LIGHT WEIGHT Assembled 4" diameter sleeve weighs but 26 lbs. Weight of 6" sleeve is 32 lbs., 38 lbs. for 8" sleeve.

SHORT LENGTH Effective length of 4 inches between end seals on all sizes. Overall length is 6 1/4".

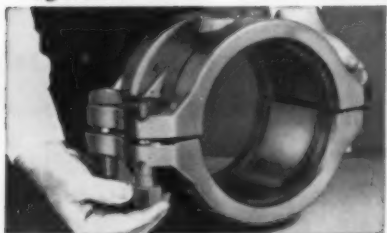
ASSEMBLED IN 3 EASY STEPS



Once the damaged pipe is uncovered, one half of the sleeve is placed on each side of the pipe.



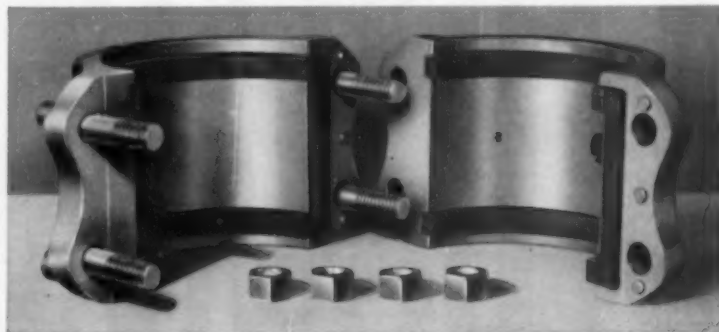
Sleeve halves are drawn together. Pre-assembled rubber gaskets make tight seal.



After the bolts are taken up finger-tight, tightening the four bolts by wrench completes assembly.

TWO-PIECE ASSEMBLY No end glands. Side and end gaskets are pre-assembled and cemented in sleeve grooves.

HIGH STRENGTH All parts are high tensile and corrosion-resistant. Sleeve halves are 70,000 psi tensile ductile iron. Nuts and bolts are high strength, corrosion-resistant alloy.



HERE'S ALL THERE IS TO IT! Illustration shows two-piece glandless construction. Side gaskets overlap ends of circumferential gaskets for tight seal. Four bolts are only accessories. Tapping boss on each half allows maximum tap of 2 inches. Regularly furnished with one sleeve-half tapped for 3/4" pipe.

JAMES B. CLOW & SONS, INC.

201-299 North Talman Avenue • Chicago 80, Illinois

Subsidiaries:

Eddy Valve Company, Waterford, New York

Iowa Valve Company, Oskaloosa, Iowa



IS MAIN STREET HEADED FOR A CRACK-UP?

Civic pride starts with good streets, and there's no better way to make sure Main Street, or any other street in town, will keep up appearances than to reinforce it with USS American Welded Wire Fabric.

There is no arguing concrete's compressive strength. It actually improves as the concrete ages. But concrete lacks tensile strength, and steel is at its best in tension. Both compressive and tensile strength are needed to preserve the structural integrity of a concrete slab. Steel welded wire fabric is the ideal high-tensile strength material for concrete reinforcement. It distributes stresses uniformly throughout the slab and controls temperature, moisture, load

and soil shift cracking.

Actual measurement has shown that welded fabric's ability to control cracks adds 30% to the strength of the slab.

USS American Welded Wire Fabric is made of cold-drawn wire with a minimum yield strength of 60,000 psi and a minimum tensile strength of 75,000 psi. It is precision-made to your exact size and style requirements, ready for immediate placement. For full information, write American Steel and Wire, Dept. 1277, Rockefeller Building, Cleveland 13, Ohio.

Innovators in Wire USS and American are registered trademarks

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Division of
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Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Export Company

**SIMPLIFIED
BY SIMPLEX**



Simplified by Simplex: New Float in Flume meter measures with great accuracy the flow of various kinds of liquids in channels, sewers and other gravity flow systems — and radically slashes construction costs.

New "Float in Flume" obsoletes the stilling well — saves you its construction cost

Now you can measure open channel or sewer line flow accurately without a stilling well—but at a fraction of the construction, installation and maintenance costs.

The "Float in Flume" is simplicity itself. A vane, floating atop the liquid passing through the flume, senses the liquid level. This data is transmitted through a Simplex transmitter-receiver system (pneumatic or electric), and is translated into flow terms on a modern, easy to read Simplex type "L" meter.

You save all the costs formerly required by a stilling well: the extra excavation and concrete, float pipe, grating, valves, drain pipe and fittings, cleaning valve and sediment chamber.

You don't even need a purging system. An occasional wiping of the vane is all the cleaning required. The Float in Flume transmitter may be installed in existing flumes or is furnished assembled with a Simplex Type "S" Parabolic Flume as shown above.

Before you install another meter requiring a stilling well, check the savings of the Float in Flume meter. Drop us a note today and ask for Bulletins 726 and 728.

Simplified by Simplex: New Type "L" Meter is more modern, more compact. Big red-and-white helical indicator replaces pointer, makes reading easier. Continuous type totalizer unsurpassed for accuracy. All parts are mounted on swing-out panel for easy servicing.



**SIMPLEX VALVE AND
METER CO.**

LANCASTER, PENNSYLVANIA

a division of



PFAUDLER PERMUTIT INC.

Ed Cleary comments on:

Improving Your Annual Report

EDWARD J. CLEARY

Diplomate, American Academy of
Sanitary Engineering
Cincinnati, Ohio

THIS IS THE TIME of the year when public agencies are faced with a perennial task—preparation of an annual report. Is this chore regarded only as an exercise in meeting legal necessities? Or does it suggest an opportunity—a privileged one—for enthusiastic accounting of stewardship?

More than likely it is the satisfaction of legal requirements that serves as the motivation for producing most public-agency reports. But the law does not specify that a report must be an uninspired assembly of trite statements and tiresome statistics. Quite to the contrary, the function of the annual report is to convey information. And there are ways of doing this that invite and hold attention.

Where to Find Clues

Perhaps the quickest way to get some clues on how to improve your annual report is to examine those prepared by others. From such a perusal here are a few conclusions that might be reached:

Some agencies are employing the annual report as an effective device for explaining why they exist and what they do to justify their existence. In this fashion they lay the groundwork for better public undertaking and support. They not only illuminate accomplishments but also focus attention on deficiencies and suggest how they might be overcome. In brief, the report is regarded as something more than a catalog of gallons of water pumped or miles of street paved.

It appears, therefore, that successful annual reports are built around a theme or message related to the goals or program of the agency. The specific theme may not necessarily be stated in so many words. But from the evidence of structural unity and coherence in the report a theme did exist in the mind, at least, of the person who organized it.

For example, the report of a water department quite logically might lend itself to the theme of: What is being done to insure better service? Immediately this suggests a structural arrangement of content. The report could be sectionalized to deal, respectively, with improvements in supply, treatment and distribution. Equally important, the presentation of what has been accomplished provides the springboard for jumping into matters that have not yet received attention and explaining the reasons why. Thus the report has been made to serve a twofold role.

Telling the Story

Another conclusion to be drawn from a perusal of annual reports is that those with pulling power



*Have You Seen the
"Oxigest" Movie...*

the new 16mm, color-sound motion picture on the Smith & Loveless Factory-Built "Oxigest" Sewage Treatment Plant, now being shown by our sales representatives all over the United States and in Canada.

You can enjoy this informative, entertaining film in your own office via a unique, portable projector (above) that looks like a television set and takes just seconds to set up for a showing.

The 15-minute "Oxigest" film features an unusual, animated sequence (starring Mike Microbe) to explain the "Aerobic Digestion" or super-aeration treatment process—plus the operational characteristics, design features,

the manufacture and installation of "Oxigest" sewage treatment plants by Smith & Loveless.

If you want to know more about sewage treatment for outlying subdivisions, motels, schools, mobile home parks, factories and other applications—be sure to see this movie!

Another industrial movie on Smith & Loveless Factory-Built Sewage Lift Stations is also available—a 21-minute, color-sound film on factory-built sewage pump stations and Smith & Loveless' complete line of pneumatic ejectors.

Available free, upon request, for viewing in your own offices, for meetings and conferences. Just write Department 40.

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(2017)



**EXTRA STRONG . . .
BETTER LOOKING . . .
LIGHTER WEIGHT!**

Exclusive swaging and forming process prevents cross bars from turning, twisting, coming loose or falling out . . . provides greater strength and rigidity than gratings using obsolete methods of joining bars. Only Gary Galok Aluminum Gratings offer all these advantages:

High strength to weight ratio. Minimum deflection . . . easier to install.

Non-rusting and corrosion resistant. Ideal where chemical conditions prevail.

Can be used for decorative purposes, sun-shades, grilles, etc. Can be anodized in sunfast colors to blend with surroundings.

Available with serrated or plain bars—in all sizes to meet practically every requirement.

*Patent Pending

Write for Bulletin A759
Dept. L-21, E. Seventh Ave., Gary, Indiana



ROCKWELL-STANDARD
CORPORATION



Grating Division, Gary, Indiana

have found how to tell the story quickly and simply.

With regard to wordiness it is pertinent to recall an admonition of Alexander L. Crosby, a specialist in writing annual reports. He points out: "Overwriting is a sin that must be paid for twice. You pay the printer first because each extra page costs money. You pay second by losing a large part of the potential audience, some through weariness, others because your budget will not allow you to print and distribute as many fat pamphlets as thin ones."

With regard to simplicity of expression, this paraphrase of a slogan given to cub news-reporters would seem to apply: Write it for the man in the street; the fellow in an ivory tower will understand. Engineers in particular might heed this injunction. Professional jargon has its place. But that place is not the annual report. This recalls the predicament of one city engineer whose annual report was liberally sprinkled with references to BOD, cfs and MPN. He received his comeuppance from a councilman who said: "You have a right to expect me to know what p p is; but what in hell is ppm?"

Not the least of the difficulties that face the report writer is what to do with statistical tabulations, financial statements and other matters of record whose inclusion is dictated by legal necessities. It appears that one way out of this dilemma is to keep such things completely separate from the body of the report and put them in the back of the book in the form of an appendix.

Size and Layout

Also to be noted from a review of annual reports is that they are produced in a variety of sizes and colors, and that they appear in both printed and mimeographed form.

The preferred choice in size seems to be 8½ x 11 inches. These are the dimensions of a standard letterhead. There are good reasons why such a size commends itself. From a user's standpoint this size report fits into an office file and otherwise lends itself nicely for reference purposes. From a production standpoint it facilitates layout, printing and mailing.

Use of color undoubtedly enhances the appearance of a report. But lavish application of color will not compensate for deficiencies in content and layout. And color printing is expensive.

Unless distribution is quite limited there is small merit in producing a mimeographed report. It is not suited for reproduction of photographs, and it offers little flexibility for variation in sizes and faces of type or choice of layout.

This is not to say, however, that good appearance and layout are automatically achieved by turning the job over to a printer. Craftsmanship of a special kind is involved in dealing with the subtleties of make-up and style. In the absence of expert counsel it is well to be guided in such matters by following the example of an existing report that has been found to be attractive.

The increasing number of good annual reports should provide inspiration—if not example—on how to do a better job of communicating. And if these comments have excited any interest, then you could do no better than secure a copy of *Annual Reports—How to Plan and Write Them*, by Beatrice K. Tolleris, staff consultant of the National Publicity Council for Health and Welfare Services, Inc., 257 Fourth Avenue, New York 10, New York. The booklet costs \$1.00. □ □ □

When you open the
water meter bids...

ADD UP THE TRUE TOTAL

**BID
PRICE**



OTHER COSTS:

Revenue losses

Repairs

Obsolescence

(if any)



New Trident
Model 60
Sealed Meter

THEN make the best buy...

A water meter should be a lifetime purchase. Its price tag gives only part of its cost. Look instead for *true annual costs*:

First, think of revenue loss. A meter returns 12 to 20 times its price before its first check-up. A slight slip in accuracy loses more money than you "save" in a low bid.

Secondly, meters must be tested regularly. One that checks OK *without* repairs obviously is worth more. In the long run, the meter that is

easiest to repair is also worth more.

Finally, with most meters you must add obsolescence. But not with Trident. A Trident constantly modernizes itself. All design improvements are made to fit older Tridents too; you get them *automatically* as you insert replacement parts.

Trident meters are designed not for low bid but for low true annual cost. That's why Trident is always your "best buy."

Ask your Neptune representative.



LIQUID METER DIVISION • 47-25 34th Street, Long Island City 1, N. Y.
OFFICES IN PRINCIPAL CITIES • In Canada: Neptune Meters Ltd., 1430 Lakeshore Rd., Toronto 14, Ont.



FRINK "V" TYPE WON'T STICK OR WEDGE EVEN IN DEEPEST SNOW

SELF BALLASTING, PUSHES EASIER WITHOUT SIDE THRUST

Here's why rugged **Frink "V" Type** plows give you fast, clean snow removal—even in heavy, wet snow.

Patented Heel Chain Suspension, plus exclusive Pivoted Drive Bars, add extra bucking power, positively end wedging at any speed, in any snow. Exclusive self-ballasting feature prevents nose from "riding up," prevents slipping when widening out.

And a **Frink "V" Type** pushes easier. The cutting edge and front of moldboard have just enough sheer to keep snow moving at all times, without causing side thrust.

Unique paneled construction on **Frink "V"** adds strength, cuts weight. You save on truck wear and tear, cut repair bills and operating expenses.

Frink "V" Types are made in 9 standard sizes (with either hand or power hydraulic control) for light to extra-heavy plowing. For complete details, write Dept. PW 12-61

FRINK SNO-PLOWS, INC.

Engineers of Major Advances in
Modern Snow Plow Construction

Frink Sno-Plows Inc., Clayton, New York

In Canada:

Eastern Steel Products Co., Preston, Ontario

Waterborne Disease Outbreaks in 1960

The Public Health Service reports 11 waterborne disease outbreaks during 1960. These included two small outbreaks of typhoid fever with two cases in one of them and 6 in the other; three outbreaks of hepatitis; two of shigellosis or bacillary dysentery; and three of gastroenteritis. Only one of the 11 outbreaks was attributed to a public water supply. A large number of cases (about 1400) of shigellosis occurred after a breakdown in a community water treatment plant. All other outbreaks were associated with the use of water from wells or springs.

In the ten years ending in 1960, there were about 65 reported outbreaks of disease which were due to unsafe water. The records presented do not show clearly what proportion of the 100,000 cases of illness were due to waterborne infection and what to food-borne. It is estimated, however, the annual average cases resulting from consuming infected food and water ranges from 100,000 to 200,000.

Cross-Connection Control in Chicago

Inspections were made during 1960 by the Chicago Bureau of Water, to locate and eliminate cross-connections between primary (pure) and secondary water supplies and submerged inlets. There were 46,656 fixtures and connections inspected of which 17,378 or 37 percent were in violation of the applicable ordinances.

In addition to this continuing work, inspections and surveys were made in areas where large numbers of buildings were razed for slum clearance, superhighway construction or large housing projects to assure that all unused service pipes were properly cut and sealed to prevent waste of water. Inspections of air conditioning and refrigerating equipment and water-supplied appliances, as clothes and dish washers, were also made. All this work is under the Plumbing Section of the Water Distribution Division of the Bureau.

Bids on Sewers, Water Lines and Sewage Treatment Plant

Bids on constructing a sanitary sewerage system and a water distribution system for Hummels Wharf Municipal Authority, Pa., were received Oct. 26. Park E. M. Barnes of Mill Hall, Pa., was low bidder at \$339,128.50. Bids were received at the same time for a sewage treatment plant. On this, Moseman Constr. Co., Harrisburg, was low bidder at \$189,800; H. I. Lewis Constr. Co., Middletown was next low at \$203,540. Various alternate bids and bids on additional items were also received. William E. Sees, Jr., 4335 North Front St., Harrisburg, Pa., is consulting engineer.

Unit Costs of Refuse Collection and Disposal and Street Cleaning

Unit costs of sanitation are reported by the Department of Public Service of Arlington Co., Virginia, as follows: Refuse collection \$2.93 per person for 1961, compared to \$2.84 in the two preceding years; incinerator operation \$1.03 per person for 1961, compared to 96 cents and 88 cents for 1960 and 1959, with a cost of \$2.30 per ton of refuse incinerated in 1961; street cleaning, 44 cents per person in 1961, compared to 40 and 39 cents for the two preceding years.



The Oklahoma Test Road north of Oklahoma City will eventually be part of Interstate route 35

concrete wins on Oklahoma Test Road **with maintenance cost 65% lower than asphalt!**

5-year traffic test, ordered by the Oklahoma legislature, confirms again the findings of state highway departments and other official tests. Connecting two-mile sections of concrete and of asphalt, both the best of their type, were built in 1955 on Oklahoma's US 77. For five years beginning Jan. 1, 1956, exact records were kept of all *pavement* maintenance costs. Total for concrete: \$557.82. For asphalt: \$1,591.87. And not only did the asphalt cost nearly 3 times as much to maintain during the five years—it is already getting its first resurfacing at an additional cost of \$43,753.

Substantial maintenance economy is one reason why concrete is the choice of so many states today. Engineers are designing concrete pavements to last 50 years and more. It's the one pavement that can be designed *mathematically* to meet specific wheel load requirements. It's the only pavement with beam strength and stability.

The Oklahoma Test Road proves again the long-term value of concrete pavements. The first cost isn't just a down payment. Concrete provides true economy for Interstate highways as well as for other heavy-duty roads.

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete

Complete resurfacing after only five years adds another \$43,753 to asphalt's upkeep!

Despite continued surface maintenance for five years, the asphalt pavement on the Oklahoma Test Road has deteriorated to the point where complete resurfacing is required. The asphalt sections are being overlaid with 1½ inches of surfacing to seal out moisture and provide a new wearing course. When comparison is made, as shown here, on the basis of *total upkeep* cost, concrete's advantage is dramatic.

CONCRETE

5-year surface maintenance.....	\$557.82
total surface upkeep.....	<u>\$557.82</u>

ASPHALT

5-year surface maintenance.....	\$1,591.87
complete resurfacing.....	<u>\$43,753.00</u>
total surface upkeep.....	<u>\$45,344.87</u>

This compact Model H-30B
can handle such a variety of jobs that it is

always busy

every season of the year

Equipment that stands idle in the garage or yard much of the time because there is no work it can do, is a poor investment. On the other hand, a machine that can be used and useful all twelve months of the year is an investment in tax-saving you can always be proud of.

This is why the multi-purpose, all-season usefulness and work-ability of the compact Model H-30B PAYLOADER has been verified and acclaimed by public bodies of all kinds and sizes, from states to townships—why it has become one of the most popular machines ever made available for public works use!

All-seasons 4-wheel-traction. Four-wheel drive and large tires, plus power-transfer differentials, enable it to go wherever you need it at speeds up to 21 m.p.h., and work fast and efficiently when it gets there. Its better traction, greater power and more rugged design costs you only a few cents more per hour to own than light utility-type loaders, yet it can do 25 to 50% more work per hour.

Big Capacity, Easy Operation, Safety. The H-30B can outperform many larger machines because of design features that provide greater operator efficiency, safety and visibility. It is the only loader in its class with a "full" power-shift transmission that does not require stopping and engaging gears for a range shift. There are three speeds both forward and reverse, and all shifts in either direction can be made "on-the-go."

It has power-steering, and the powerful four-wheel sealed brakes can be applied with or without disengaging the transmission—another exclusive feature in this size. It is the only loader in its class with boom arms positioned ahead of, and away from the operator. There is an adjustable bucket-type seat, and the sloped-down front and simple

boom mechanism gives the operator unmatched visibility.

Easy Servicing, Less Maintenance. The H-30B is the only loader in its class with simplified boom mechanism and single bucket tilt cylinder having 6 to 12 fewer pivot and grease points to service. All bucket and lower boom-arm pivot points are sealed against dust and dirt. The battery, instrument connections, fuel tank and transmission can be serviced from ground level.

Extra Dividends. Every H-30B owner can take advantage of one or more of the useful optional attachments that are available for it—attachments that have been carefully engineered to insure easy mounting and efficient operation on this PAYLOADER. They greatly extend the job range of the loader and its tax-saving potential!

There is the patented Drott "4-in-1" Bucket that can do shovel, clam, scraper and bulldozer operations—can grasp and load slabs, stumps, trees and curbstones.

The Wain-Roy Backhoe attachment is the finest of its kind—built by the originators of the hydraulic tractor backhoe. It mounts and dismounts easily with only four pins and two hose connections.

Ram Pick-up Sweepers and Blacktop Spreaders—also Snowplows of the Rotary, V, and Blade type—are also available.

The 1¼ cu. yd. Model H-30B offers a choice of gasoline or diesel power, and optional buckets from ¾ to 2½ cu. yd. for handling materials of various weights. Your HOUGH Distributor is ready to show you all the advantages of this PAYLOADER. He also has the finest of service and parts facilities backed by HOUGH field service personnel. See him today.

THE FRANK G. HOUGH CO.
761 Sunnyside Avenue, Libertyville, Ill.

12-B-6

Send full data on the Model H-30B PAYLOADER

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THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS

SUBSIDIARY - INTERNATIONAL HARVESTER COMPANY



HOUGH, PAYLOADER, PAYDOZER, PAYMOVER, PAYLOGGER, PAYLOMATIC and PAY are registered trademark names of The Frank G. Hough Co.

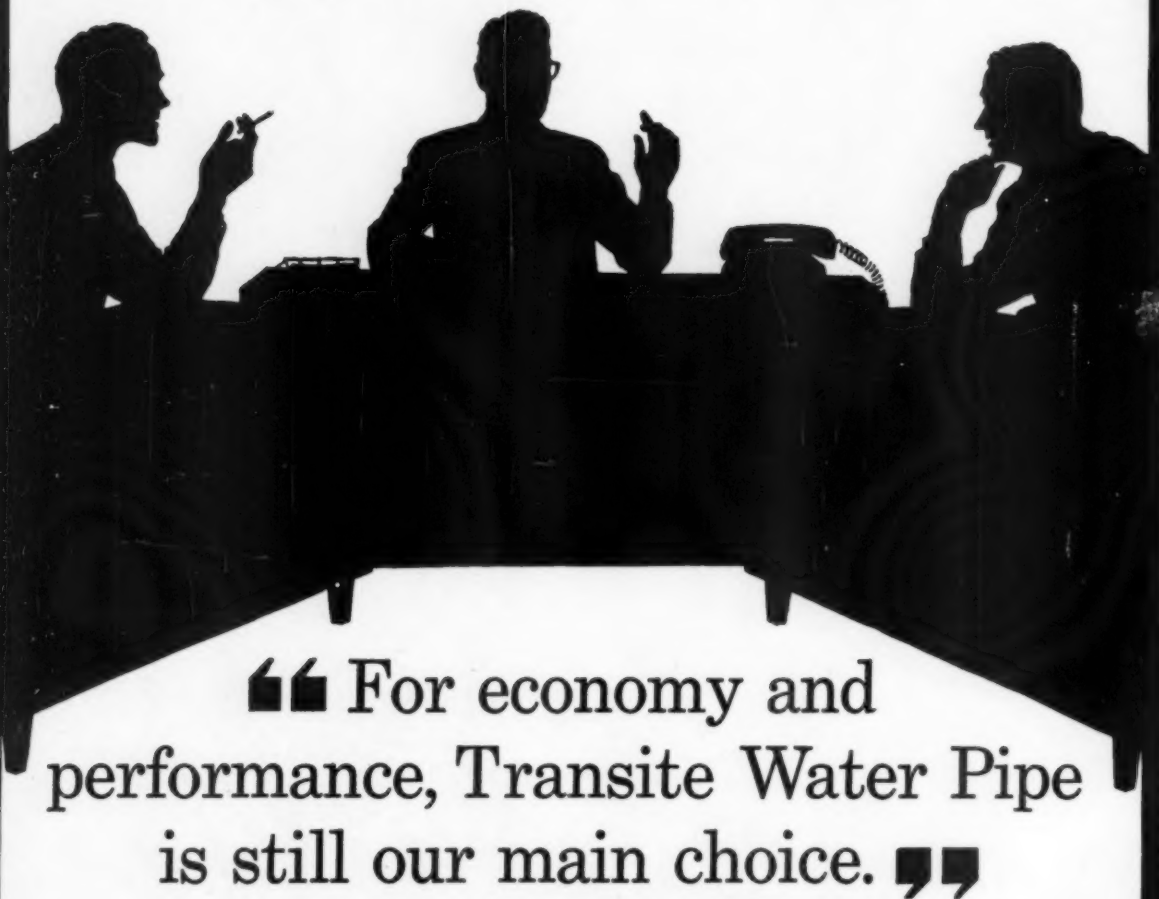
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PAYLOADER®

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Three County Commissioners from Ohio report:



“For economy and performance, Transite Water Pipe is still our main choice.”

Belmont County, Ohio, Commissioners William H. Dorsey, Austin C. Furbee and Louis T. Salvador.

“Belmont was one of the many counties that experienced a building and population boom. Fortunately, our officials had the foresight to recognize its ultimate effect on our water system and service. As early as 1953, plans were made to meet future demands. Surveys were made . . . operating men and engineers were consulted . . . pipe materials investigated.

“In 1956, we extended our water system 13 miles. The installation and operating economies are now a matter of record. The successful performance of the extension is attributed to careful planning, helpful advice and, in part, to the selection of Transite Pipe.

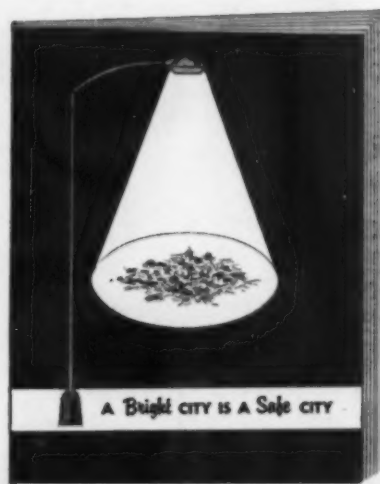
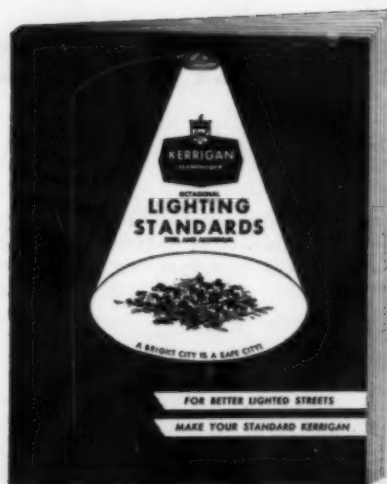
“When we began designing another expansion of the system for 1960, our previous experience made Transite the main choice. The Belmont Water System now has 53 miles of Transite installed in rocky terrain and corrosive soils. The excellent performance of the first 13-mile section leads us to believe that Transite will provide economical maintenance and operation for many years.”

For the full Transite® story, write Johns-Manville, Box 362, PW-12, New York 16, N. Y. In Canada: Port Credit, Ontario. Cable address: Johnmanvil.



JOHNS-MANVILLE
TRANSITE PIPE
THE WHITE PIPE THAT PROTECTS PRICELESS WATER

PUBLIC WORKS for December, 1961



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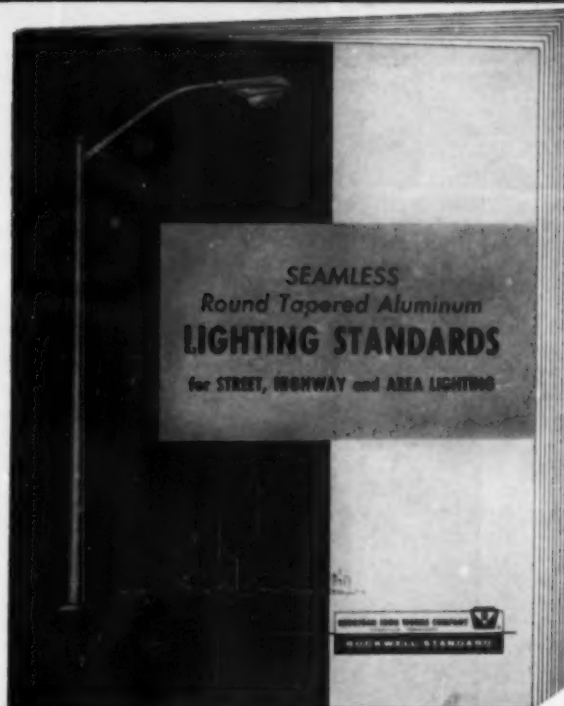
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Here's aid for you in planning your street and highway lighting projects. Seven catalogs describe and illustrate (with full engineering data) our new line of attractive, round tapered aluminum shafts . . . trim-tapered octagonal standards in steel and aluminum . . . traffic signal structures . . . strain poles . . . brackets and mast arms . . . and overhead sign supports. All seven are available to you free. Send for your copies NOW. Brighten up YOUR city or town!

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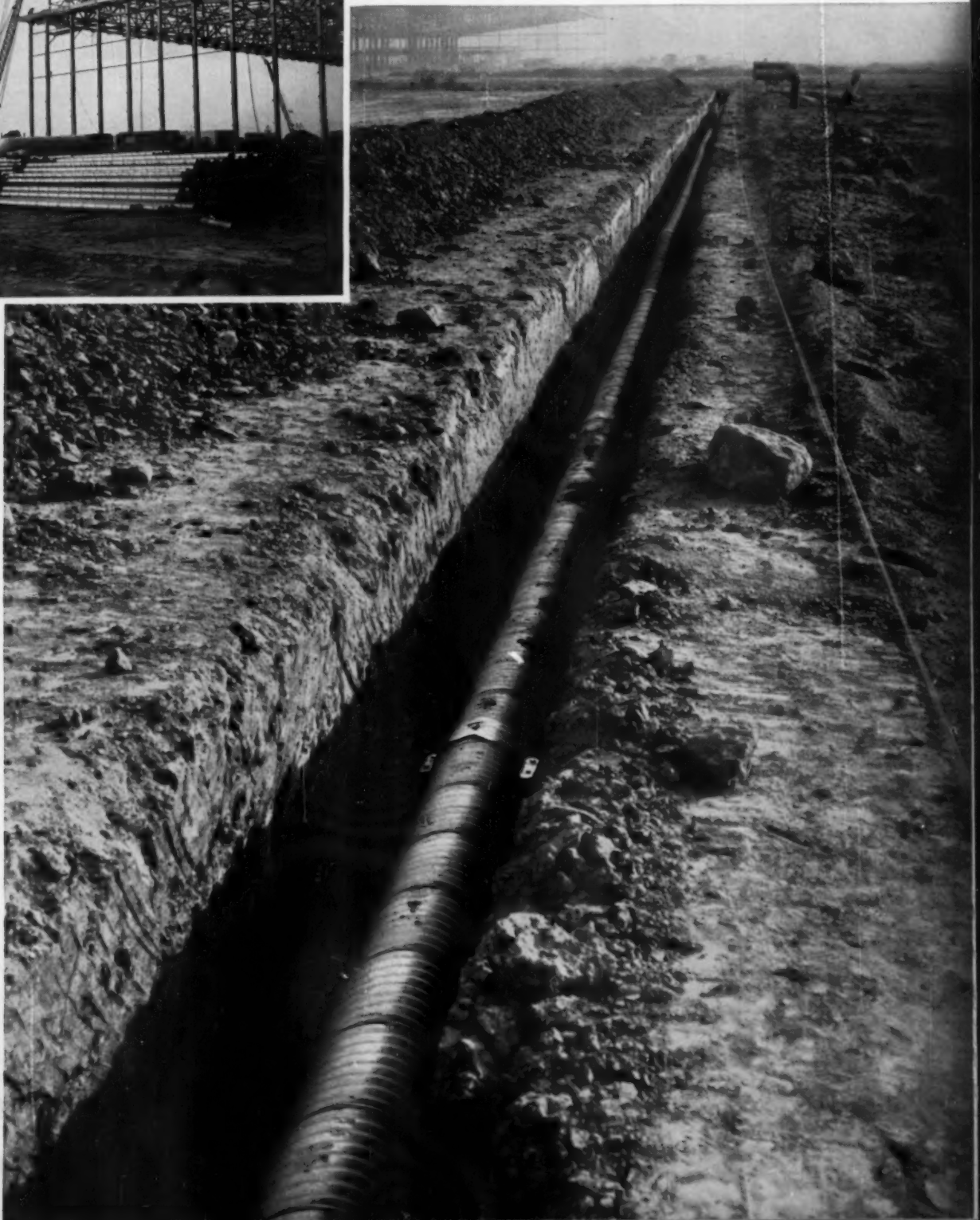
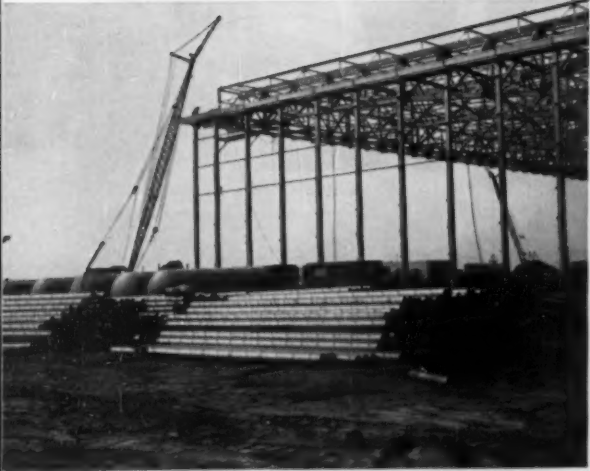


STREET AND AREA LIGHTING AND SIGNAL STRUCTURES



56,315 FEET OF REPUBLIC

Literally miles of Republic Drainage Products have gone underground at Chicago's \$135,000,000 O'Hare Field expansion. Now covered by reinforced concrete many inches thick, Republic LOK-COR shown here is relied on to keep pavement and subsoil dry for the life of the runway.



DRAINAGE PRODUCTS

installed at O'Hare Field

Nearly eleven miles of Republic Drainage Products are being installed at O'Hare Field, Chicago, to help drain an area totaling 7,000 acres ... very likely the largest project of its kind ever undertaken.

Republic **FREE-FLOW** and Republic Asphalt Coated and Paved Pipe up to 96" diameter have been installed beneath two new 11,000 foot jet runways, to handle water run-off. The pipe must stay in service ... for the life of runways. Republic **FREE-FLOW** and Republic Asphalt Coated and Paved Pipe will. Like all Republic Drainage Products, these are made of heavy gage galvanized steel, corrugated for strength—and can be counted on to withstand constant impact, weight, and vibration of jet transport landings and take-offs.

FREE-FLOW has been installed in large, storm capacity sizes for drainage of graded areas along runways. Under hangars and hangar aprons more Republic **FREE-FLOW** and Asphalt Coated and Paved Pipe is used. In addition, many hundreds of feet of Republic **LOK-COR** Subdrainage Pipe, Galvanized Corrugated Pipe, and Pipe-Arch have been placed under approaches to hangars to carry away surface and subsurface water.

Contractors installing Republic Drainage Products used at O'Hare found advantages in fast, easy installation. Simplified design assures rapid, correct assembly ... prompt deliveries direct from Republic's Hammond, Indiana Culvert Plant, keep the job on schedule.

This is a big job ... but Republic Drainage Products are designed and priced for the small ones, too. Whatever your next project, look up your Republic Distributor for pipe that goes down fast and stays down. For complete literature, mail coupon.



REPUBLIC STEEL

REPUBLIC HAS THE FEEL FOR MODERN STEEL



Thousands of feet of Republic **FREE-FLOW** Sewer Pipe were installed at O'Hare with minimum labor and equipment costs. Largest diameter 96" **FREE-FLOW** seen here is installed in the same manner as smaller diameters. Note lifting lugs for handling ease.



Ease of handling lengths of **LOK-COR** is demonstrated here. Pipe went in as fast as trenchers made the excavation—an important advantage in meeting an early 1962 completion date.

Republic Drainage Products used in O'Hare Construction Project

RUNWAY DRAINAGE

Contractor: Consolidated Construction Co.—Chicago

Material: 1,100 feet of Republic **FREE-FLOW** and Asphalt Coated and Paved Pipe, 24" through 96". 600 feet of Republic Pipe-Arch.

TWA HANGAR

Contractor: Mayfair Construction Co.—Chicago

Material: 6,200 feet of Republic **FREE-FLOW** and Asphalt Coated and Paved Pipe, 12" through 42". 1,220 feet of Republic Pipe-Arch. 10,000 feet of Republic **LOK-COR** Subdrainage Pipe, 6".

AMERICAN AIRLINES HANGAR

Contractor: Malan Construction Corp.—Chicago

Material: 6,900 feet of Republic **FREE-FLOW** and Asphalt Coated and Paved Pipe, 12" through 42". 675 feet of Republic Pipe-Arch. 8,000 feet of Republic **LOK-COR** Subdrainage Pipe, 6" perforated.

UNITED AIRLINES HANGAR

Contractor: W. E. Schweitzer & Co.—Evanston

Material: 4,000 feet of Republic **FREE-FLOW** and Galvanized Corrugated Pipe.

300 feet of Republic Pipe-Arch.

13,000 feet of Republic **LOK-COR** Subdrainage Pipe, 6", 8", 10".

NATIONAL GUARD HANGAR

Contractor: Mayfair Construction Co.—Chicago

Material: 1,600 feet of Republic **FREE-FLOW** and Corrugated Metal Pipe, 8" through 36".

1,200 feet of Republic **LOK-COR** Subdrainage Pipe, 6".

RUNWAY GRADING AND DRAINAGE

Contractor: S. J. Groves—Minneapolis

Material: 1,520 feet of Republic **FREE-FLOW** Pipe, 60" through 96".



Here, a specially fabricated inspection hole is being installed in lengths of Republic **LOK-COR**, the drainage pipe that is helically corrugated for strength. The two-piece connecting band seen at right provides fast, positive joints.

REPUBLIC STEEL CORPORATION

DEPT. PK-2244-A

1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send complete information on these Republic Drainage Products:

- ☐ Sectional Plate Pipe, ☐ **LOK-COR** Subdrainage Pipe
- ☐ Pipe-Arch, and Arches
- ☐ Corrugated Metal Pipe ☐ **FREE-FLOW** Sewer Pipe and Pipe-Arch
- ☐ Plain Galvanized, Asphalt Coated, and Asphalt Coated and Paved Pipe

Name _____ Title _____
 Company _____
 Address _____
 City _____ Zone _____ State _____

Naess & Murphy: Architect—Engineer for City of Chicago.



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INTERNATIONAL HARVESTER



● **IMPROVEMENT** necessitated complete removal of two blocks of downtown paving and walks. Picture shows work under way with disconsolate business men looking on.

Bold Program Rebuilds Downtown Street

JOHN T. RINEHART City Engineer, Logansport, Indiana



● **AFTER** the job was completed: Another traffic lane was added; excessive street crown was removed; storm flooding was eliminated; and utilities were reconstructed.

WITH THE cooperation of the downtown property owners and the support of the Indiana Highway Department, Logansport (population 21,000) launched a street improvement program on a street that has been a source of embarrassment to many local residents for several years. The downtown business section on Market Street has been losing business at an alarming rate for the past few years. At present there are 6 vacant business locations in the area from Third to Fifth Streets, and many thousands of square feet of empty floor space on upper floors.

Many reasons and excuses have been given for the loss of business in this area: The shopping centers, basements in the area flood, motorists dislike parking on a sideslope which results from the street having a high crown, the narrowness of the street, the dilapidated store fronts owned by non-residents, dangerous sidewalks and the fact that Broadway with its wider street and sidewalk naturally draws all of the trade.

After several years of promises and apologies, city officials were presented with "another petition on Market Street" in 1960 asking that the street be widened and new sidewalks be installed in the downtown area of Market Street. The city officials met with representatives for the Market Street merchants and promised to contact the state highway department to try to get the street improved.

Mayor Otto Neumann, City Attorney Richard Molique and City Engineer John Rinehart met with the state highway engineers and discussed the problems and possible solutions. The fact that this street was only 66-ft. wide from store front to store front didn't help. The other main downtown street, Broadway, is 82½-ft. wide and handles three lanes of traffic nicely. Back around the canal days and the turn of the century when Logansport was actually competing with Chicago for business growth, the area on Market Street from 2nd to 3rd was laid out as a market place and the street is 100 feet wide in this area. Motorists entering the intersection at 3rd on Market Street from the west, find the street suddenly narrowing in on them.

Years of discussion with local merchants clearly ruled out the possibility of eliminating parking on either or both sides of the street. The merchants had agreed that they "would rather have crowded narrow sidewalks than wide side-

**PUBLIC
WORKS**

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DECEMBER, 1961

walks with no one on them." The following facts were some of the reasons for going ahead with the project: 1) The majority of the basement flooding problems could be eliminated by new and adequate storm drainage; 2) the street had been surfaced over the old street car right-of-way resulting in some 18 in. of crown that could be corrected with a new street; 3) by narrowing the sidewalks, the state could get three lanes of traffic through the downtown area; and 4) the undeniable fact that the city had to replace the sidewalks and repair the underground utilities anyway.

The state sent survey crews and drilling equipment to the site in early 1960 and began the necessary ground work on the project. The state highway department was to design and construct the new reinforced concrete pavement. The state was to advertise for removing and replacing the street portion between the original curbs, while the city was to reconstruct the area from the original curb to the building front. There were several basements under the old sidewalk extending out to the original curb line to be taken care of by the city.

The city and state advertised and received bids for their respective portions of the work with the promise of co-operation from the property owners involved. The project was dropped in 1960 when it became apparent that a sufficient number of owners were still undecided as to the final result of the project. While some of the renters who have since moved from the area signed for the project, the owners' signatures were required on the petition.

The continued deterioration of the sidewalks and the further loss of business on the street, coupled with the fact that the city and state had actually been ready to go ahead, were used as effective arguments to cause still another petition to be circulated in early 1961. Many had felt that the whole project, up to the actual awarding of bids, had been strictly political and weren't ready to accept the idea that the job could and would be completed.

A concentrated effort from several influential sources produced the necessary owners' signatures on the petition that was presented to Governor Matthew Welsh by Mayor Otto Neumann and City Engineer John Rinehart. The Governor promised all assistance possible from the state highway department,

but cautioned that since it was getting late in the scheduling program and since the project had been dropped by the city and consequently by the state in 1960, there might be some delay in re-scheduling the work.

Project Gets Green Light

As a result of this meeting with Gov. Welsh, local feeling began to favor the project and after several additional meetings between the city, state and property owners, the state highway department gave the project the green light. The contractor for the city's work began removing concrete late in June. Traffic was permitted to use the north side of the street as the contractor and the electric, gas, sewage, and water utilities began their repair and replacement work on the south side. As work progressed to the north side of the street, traffic was re-routed around the area. Since there are two gas mains and two water mains under the street, these utilities have done considerable work in the way of preventive maintenance at this time. New services have been run into all stores and old joints on the mains are being clamped to prevent future leaks. New street lights have been installed with the resulting electrical duct work going in under the new sidewalks. Traffic control cables are underground also. Additional storm drains have been installed to handle the surface run-off from the hill at Seventh Street. Improved parking layout provides for easier parking parallel to the curb.

All of this work has been completed in eight weeks time by simply having the workmen take over the street and each department work where and as it could. The general contractor removed the old concrete and moved on down the street until the various utilities

completed their work before returning to install the new sidewalks.

Approximate cost of the project was \$114 thousand, distributed as follows: Sidewalk, curb and gutters \$21,400; state highway \$43,100; electric \$26,000; water \$5,000; sewerage \$3,500; gas \$14,000; and parking meter revenue loss \$1,100. The city agreed to share fifty percent of the \$14.86 per lineal foot cost of new sidewalk and curbing with the property owners when it became apparent the project would again fail unless this concession were made. An attempt by the city engineer to start a sidewalk improvement fund established by taxes was rejected by the city council.

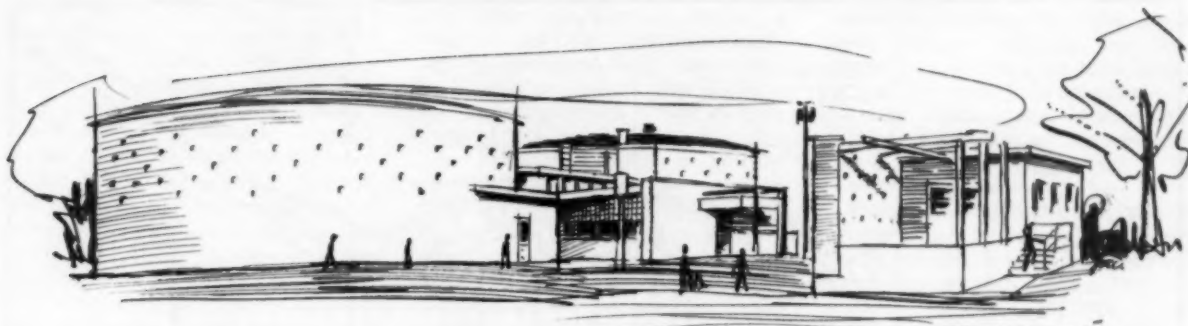
Traffic is moving once again on Market Street but it is far from being "back to normal." The old sidewalks, narrow street, cramped parking, high crown and poor lights have given way to a new Market Street and the entire community takes pride in this latest city improvement.

The Logansport Area Chamber of Commerce sponsored a three-day program, "Downtown Improvement Days—A Salute to Market Street." Approximately one hundred merchants gave a total of \$4,200 in prizes that 40,000 people competed for as a result of some 200,000 tickets given away with any purchase from the local stores. The program started Thursday, September 21st as the State contractor was finishing his clean-up and the City was finishing the painting of parking areas. The program was concluded Saturday, September 23rd when the Mayor and visiting dignitaries officially opened the street to traffic.

While the merits of the project have been and will be argued for months to come, most people agree that it was a very necessary and worthwhile expenditure. □ □ □



● CONSTRUCTION processes brought to light a number of odd things. This shows a section of an all-marble sidewalk put down years ago to serve Logansport citizens.



From Six Outfalls to One Treatment Plant

BRUCE B. WATTS
Harold Hoskins & Associates,
Consulting Engineers,
Lincoln, Nebraska

MORE than half a century ago construction began on the original sewerage system for the city of Great Falls. At that time, as was true in many other cities, much of the system was designed as "combined sewers," i.e., sewers that would carry both sanitary wastes and storm runoff to the Missouri River. This system performed its dual function for many years without too many difficulties and with only minor alterations to the system.

As the city expanded and additional sewers were required, the system was gradually and partially separated. Between 1946 and 1949 storm sewers were constructed which took much of the load off the combined sewer system. Since 1949 the growth of Great Falls has been quite rapid.

In 1958 when preliminary work was started on a sewage treatment plant there were six outfall sewers discharging into the river, ranging from an 18-in. line carrying a maximum of 40 gpm to a 48-in. with a maximum of 5.5 mgd. Two of the outfalls were located on one side of the river and carried 78 percent

of the load. Four and one-half miles separated the first and last discharge into the river with the largest about midway. The topography of Great Falls is such that the largest outfall is upstream from its connected collector system. The high point about two and a half miles downstream from this outfall is 90 feet higher. The rocky river bank in this area discouraged the construction of an outfall paralleling the river to locate a plant downstream from the city. Preliminary surveys resulted in the design of an outfall sewer parallel to the river but flowing upstream all the way to the plant site which was located directly across the river from the largest outfall. The gravity line crosses the river suspended on a highway bridge.

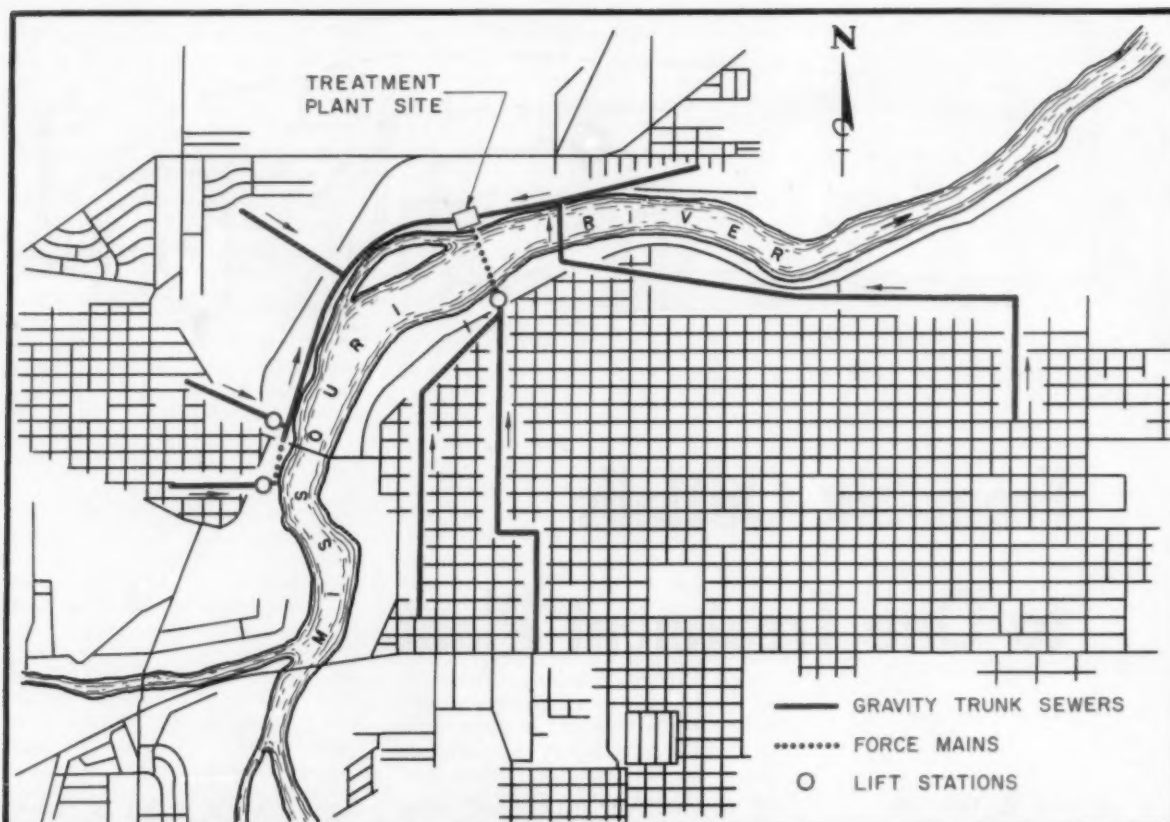
A lift station with two Chicago 2,000-gpm constant speed pumps and two 3,000-gpm variable speed pumps was constructed at the largest outfall, pumping across the river to the plant through a 24-in. submerged cast iron force main. The variable speed pumps are equipped with Electric Machinery magnetic drives and the controls are Healy-Ruff bubbler tube type. The pump sequencing is such that the level in the wet well is maintained within two feet by operating one of the variable speed pumps alone continuously or with one or both of the constant speed pumps. The flow

from this lift station is metered at the plant site with a Foxboro magnetic meter in the line. The motor control center was equipped by General Electric.

Since the discharge of this outfall was below river water level it was necessary to construct a diversion box and lift station wet and dry pits 12 feet below river water level. A 48-in. flap gate in the diversion box prevents river flow into the lift station and acts as an automatic bypass in the event of lift station failure or storm flows above lift station capacity.

Plant Design

The plant design was based on an estimated 1978 hydraulic loading of 15.5-mgd maximum hour for a population equivalent of 92,500. The Great Falls sewage is predominantly a normal domestic type requiring no special treatment. The two methods of treatment considered were (a) lagooning of raw sewage, and (b) primary mechanical and chemical treatment. Lagooning was abandoned due to surface area requirements and lack of a suitable site economically close to the city. The only available lagoon site would have required a 200-ft. lift with excessive raw sewage pumping costs. A primary plant comprising comminution, grit removal, primary sedimentation and chlorination



● **FLOW DIAGRAM** of trunk sewers serving Great Falls, Montana, showing location of lift stations and treatment plant.

along with two stage sludge digestion and vacuum sludge dewatering was selected.

Two collector sewers flow by gravity from opposite directions to the plant site lift station 14 feet below river water level. This station with five Chicago constant speed pumps, having a combined capacity of 5,500 gpm, pump to the first plant unit. The raw sewage is metered by a Foxboro magnetic meter at the wet well.

The plant lift station and the lift station across the river discharge to the Chicago Pump 36-in. Barminutor and thence to the Aer-Degritter. Two air lifts elevate the grit from the hopper bottoms to a Link-Belt grit washer. The grit washer and air compressor are located in an adjoining building. Grit from the grit washer is deposited in metal cans that can be picked up with an electric hoist and loaded on trucks without manual handling.

The effluent from the grit removal unit is divided and flows to two 100-foot diameter circular clarifiers with Eimco-Process collectors. From the primaries the flow is to a junction manhole where chlorine is added. The last step before being discharged to the river is the chlo-

rine contact basin consisting of a 60-foot diameter circular tank. The influent is near the bottom of the outer wall and is deflected by a baffle to create a circular flow in the tank. The effluent is over a central circular weir which has a diameter of six feet.

The chlorine building contains a chlorinator room, a tank room and an outside loading and storage dock. The chlorinator room contains a Wallace and Tiernan Series A-711 chlorinator with a capacity of 2,000 lbs. per day. The W & T Series A-475 evaporator ahead of the chlorinator has a capacity of 8,000 lbs. per 24 hours. Chlorine control is from a Foxboro Dynalog Sum-mator which totalizes the combined raw sewage flow through two Foxboro magnetic flowmeters. An indicating, totalizing recorder located in the control room receives its signal from the chlorinator. There is also a remote manual dosage controller located in the control building. An electric hoist unloads ton chlorine cylinders from trucks and conveys them to the outside dock, inside storage or two 4,000 lb. capacity Fairbanks, Morse dial scales.

Sludge from the two primaries may be drawn either manually or

by time clocks, through DeZurik motor operated plug valves into a sludge manhole located between the two primaries. Flow is then by gravity to a sludge well located in the lower level of the control building. Sludge pumps operated by Healy-Ruff bubbler tube controls transfer sludge from the well through the heater to the primary digester.

The main plant structure consists of two 70-foot digesters on either side of a masonry building containing an office and control room, laboratory, wash room, sludge heating equipment room, sludge dewatering equipment room, chemical storage room and garage, all on ground level. One floor down a sludge transfer pump and building heating equipment are located and two floors down is the raw sewage lift station and raw sludge well and pumps.

Two-stage digestion is used with an Eimco-Process fixed cover on the primary and a Pacific Flush Tank floating cover on the secondary. A 1,250,000-Btu-per-hour P.F.T. gas fired heater is used to heat recirculated sludge. Gas collection is from both the primary and secondary digesters using

P.F.T. safety equipment. Three Eimco-Process mechanical mixers have been installed in the primary digester. In addition to gravity flow from primary to secondary a Komline-Sanderson variable speed sludge pump is piped to transfer sludge to and from either digester and to the sludge dewatering equipment. Generated gas is used to operate the sludge heater and for building heat; the surplus is burned. Gas is metered by Roots-Connersville meters as it is generated and wasted.

A Komline-Sanderson Coilfilter is piped to dewater either raw or digested sludge but will normally be

used only for digested sludge. A conveyor belt provides truck loading of dewatered sludge inside the building. Provision is also made to load liquid digested sludge in tank trucks.

In February 300,000 gallons of water was placed in the primary digester and the heater started. Eleven days later, the digester temperature had increased from 33° to 90° F. Two days later the addition of raw sludge was started, in gradually increasing loads. Daily checks on pH, volatile acids and on the control of raw sludge added, resulted in the digester's producing gas 30 days after starting. The di-

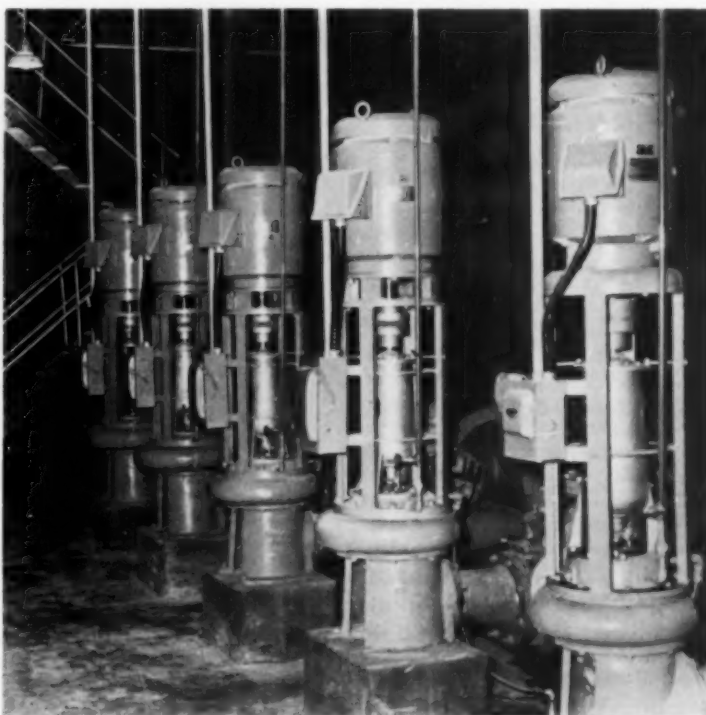
gester then received the total sludge load. Sewage flow at this time varies from a minimum hour at the rate of 0.9 mgd to a maximum of 7.2 mgd. Plant operation is on two 8-hour shifts. During the remaining 8 hours sludge draw-off is by time clock operation.

The construction cost exclusive of engineering, legal, etc. amounted to \$1,546,433 divided as follows: Plant \$845,958, lift stations, \$128,241 and collector system \$572,234.

The operation of the plant is under the direction of the City Water Department with Lowell E. Fisher, Superintendent, and LeRoy V. Lucker, Chemist. □□□



● GRAVITY sewer, an 18-inch cast iron line, is carried across the Missouri River suspended from a highway bridge. A second trunk sewer river crossing is made through a 24-inch submerged cast iron force main.

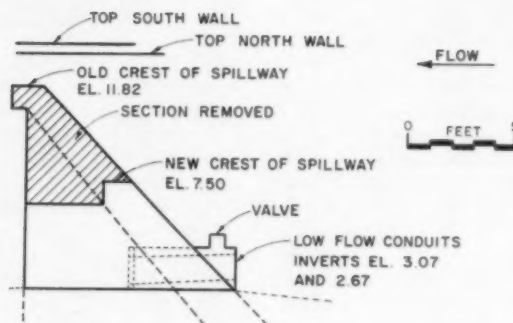


● TWO new collector sewers flow in opposite directions to the treatment plant and discharge to the plant site lift station where these five constant speed Chicago Pump units are located.



● ATTRACTIVE lift station houses two constant speed and two variable speed pumps. Discharge is to the 24-in. submerged force main to the plant.

FLOODING REDUCED by Lowering a Dam



ALFRED R. PAGAN

Hydraulic Engineer,
Bergen County,
Hackensack, New Jersey

IN THE FALL of 1960 bids were called for on the following items: Channel excavation, 300 cu. yds.; reinforced Class B concrete channel, 75 cu. yds.; creosoted timber structures, 8000 board measure; concrete bag slope, 250 cu. yds.; borrow excavation, 500 cu. yds.; timber foot bridge, lump sum; 6-ft. chain link fence, 250 lin. ft.; sub-base stone 1½ or 2½-in., 80 cu. yds.; and removal of existing structures, lump sum. The total low bid: \$37,000.

Such a job hardly sounds like the kind of project which would cause headaches to the owner, contractor or engineer. The work is similar to many of the projects which are the soul and substance of engineering performed by municipal and consulting engineers throughout the country. This one happens to be the lowering of an existing structure and the subsequent improvement of the downstream channel. It could have been the construction of a sanitary sewer line, or a new road, or an outdoor ice skating rink, or a foot bridge across a small stream.

Unique and different projects are carried to successful completion every day by the combined efforts of public bodies, private contractors and the coordinator and liaison between the two is the engineer. The problems encountered may appear to be simple, at least at first glance. In this case nothing more was necessary than the removal of the top 4.32 ft. of the dam, but even a

straight-forward problem may need a great amount of study and hard work before it can reach a successful solution.

The Borough of Ridgefield in Bergen County, N.J. (population 11,000) was plagued for many years by serious flooding along Wolf Creek. The stream is the largest flowing through the municipality, draining an area of about two square miles. In addition to Ridgefield it serves as an outlet for waters from the neighboring towns of Palisades Park, Fort Lee, Cliffside Park and Fairview. The channel falls from an elevation of 58 ft. above mean sea level at the Palisades Park boundary (finding its source in Fort Lee at an elevation of more than 300 ft.) to tidewater below Bellman Bleachery dam. Of this distance of some 7700 ft., the lower 1800 ft. functions as a mutual boundary for Ridgefield and Fairview and it is along this line that some of the most serious flooding occurs. The channel varies in profile from precipitous to flat but the reach which concerns us has a very gentle slope, averaging less than 0.1 percent. Naturally enough, any damming of the flow created a backwater curve affecting flood stages for a considerable distance upstream.

The Bellman Bleachery dam constituted such a barrier. Its spillway elevation was 11.82 ft. above mean sea level and observations (the pond not being gaged) had indicated that the pond or reservoir just upstream had reached a maximum elevation of 14± ft. during flood. It was normally kept drained, low flow passing through two openings at the bottom of the dam, respectively 16 and

20 inches in diameter. The reservoir had little storage volume and would fill up quickly as the capacity of the two orifices was exceeded. Most of the flood flow would then pass over the spillway of the dam. This resulted in the observed maximum elevation of 14 ft.

The subsequent high stages became so serious that the State of New Jersey Division of Water Policy and Supply (part of the Department of Conservation and Economic Development) was asked to study the problem. The Commission is authorized to conduct investigations into the water resources of the state and to complete comprehensive studies for specified uses and purposes, one of which is the prevention of floods. Robert E. Cyphers, Jr. of the Division subsequently authored a study entitled "Wolf Creek Flood Control, Borough of Ridgefield, Bergen County, New Jersey." Among its conclusions was a strong recommendation that the Bellman Bleachery dam be lowered.

The Borough of Ridgefield resolved to push the project to completion. Unfortunately, the structure is privately owned and, further, its south abutment rests on the neighboring municipality of Fairview. Protracted negotiations were carried on which lasted a number of years and involved officials of both municipalities, the owners of the dam, owners abutting the outlet and state and county officials. All interested parties understandably wanted to be certain that the work would not alleviate damage in one location only to create or increase it in another. An agreement was finally reached and the Borough of Ridge-

field authorized McClave and McClave, civil and consulting engineers of Cliffside Park, N. J., to prepare plans and specifications.

Hydrologic Studies

However, before this was done a study was made of hydrologic and hydraulic conditions to determine the optimum spillway elevation for maximum economic flood protection. The recommendations of this supplementary study, carried out by McClave and McClave, called for a lowering to 7.50 ft. above mean sea level and the improvement of the downstream reach through channel stabilization. The channel improvement was necessary in order to protect private property from increased flood flows which would be a consequence of reduced storage volume available above the dam. In the main it consisted of concrete bag lining on the south side of the channel. Some vertical creosoted timber sheeting was placed where an existing building needed protection from flood flows.

In the overall design it was felt that some degree of abnormally high tide should be selected for the purpose of designing the channel below the dam. A study of records dating back more than 30 years showed that no tide had reached 7 ft. above mean sea level during that period. However, several peak elevations (generally associated with hurricane winds) had reached 6.50 ft. with the extreme recorded stage being 6.90 ft. A combination of the 15-year design storm and a downstream elevation of 6.50 ft. resulted in a backwater curve (for the section of

channel involved) which did not rise above 7 ft. at the dam. Accordingly, a design elevation of 8 ft. on the south side of the channel was selected. This provided more than one foot of freeboard at all points along the improvement. The bank on the north side was also built up with earth to 8 ft.

It is anticipated that the pond elevation will not exceed 10.5 ft. with the completion of the improvement. This is a resulting lowering of the surface profile of fully 3.5 ft. at and just upstream of the dam. The lowering will be felt in diminishing degree all the way to a point 2800 ft. upstream where a change in grade results in the occurrence of a small hydraulic jump.

An interesting sidelight to the overall project is the fact that bids on two alternate methods of channel improvement were taken. Alternate A called for the channel improvement to consist, in largest part, of Class B concrete bag slope. A minor part of the work (8MBM) was to consist of creosoted timber sheeting.

Alternate B involved improving the south bank of the channel with creosoted timber sheeting only. In each case, this portion of the work constituted well over half the total cost. The average of the three bids received for the concrete bag and timber sheeting was \$40,752 and \$45,630 for timber sheeting only.

Since the two types of construc-



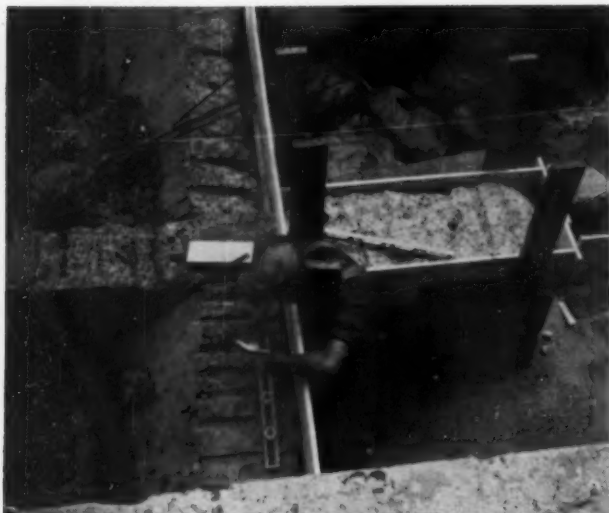
● **OVERFLOW** during minor flood on Rte. 1 bridge over Wolf Creek; pond and dam are at left. Most serious flooding occurs upstream, at right, mostly due to backwaters.



● **BEFORE improvement:** This photograph shows the condition of the stream channel before improvement. It was virtually certain that any out-of-bank stages would result in flooding.



● **LOOKING downstream** along improved section of channel. Widening of the channel and improvement in ability to carry storm flows plus protection against erosion were necessary.



● **FORMWORK** construction for rebuilding spillway to final elevation of 7.50. A foot of new concrete was added, with reinforcing.



● **COMPLETED** job showing the new dam with low flow opening at bottom left and the improved channel at rear.

tion were to be used for an equal length of reach, it is apparent that for this particular job concrete bag lining was better suited. So far it has held up very well structurally (as has the one hundred feet of timber) and is considered to be a successful installation.

From a hydraulic viewpoint, the smoother sheeting would be better for the purpose of passing maximum flows. It was used along that portion of the channel which was slightly constricted by an existing building. Here its somewhat higher cost was unimportant because a vertical face was necessary.

The reinforced concrete walls placed just downstream of the dam will serve the following purposes: 1) Absorb and dissipate the energy of the waterfall over the spillway; 2) direct the flow axially into the regular channel, important since the stream makes a change in alignment of approximately 20° just below the dam; and 3) create a satisfactory transition to the correct downstream channel width.

The channel lining was necessary for a variety of reasons. The property owner on the south side, in Fairview, owns the dam and was reluctant to allow it to be modified without provision for adequate protection from erosion. Further, since this stage of the improvement is only the first step toward the creation of adequate channel capacities all along Wolf Creek, it was necessary to widen the channel to carry the ultimate design flow (15-year return period). Upstream capacities are far below the design flow at the present time but as the proposed improvements are completed the

full design width and depth will be fully utilized.

The work was started by the prime contractor (George Brewster & Sons of Bogota, New Jersey) in the late fall of 1960. The severe winter of 1960-61 which brought with it three snowstorms of blizzard proportions disrupted a tight time schedule and slowed the project.

Most of the work on the concrete bag wall and timber sheeting was finished in the fall of 1960. Both types of construction withstood the severe winter very well. The largest part of the job had to be closed down for the winter—the construction of the reinforced concrete pad and retaining walls, located below the dam. According to the contractor, he had planned to pour the con-

crete pad (which was also, in effect, a spread footing for the walls) just before bad weather set in. Unfortunately the first blizzard of the season struck just a few days before his scheduled pour. If the pad had been completed it would have been possible to continue work through the winter. A completion date fully three or four months earlier might have resulted.

The last of the work was completed in June of 1961. Since then no major flood has come rampaging down the creek to test the design and workmanship. Still, if long and tedious hours of study and close supervision coupled with responsible contracting are any criteria, the money spent will have proven to be worthwhile. □ □ □

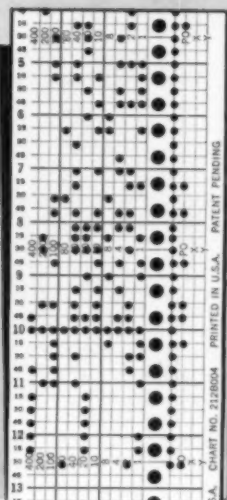
Packaged Water Plant Supplies Naval Depot

The first Rotoflow Water Purification Plant assembled by Northwest Filter Co., Seattle, Wash., was recently delivered to the Bangor, Washington, Naval Ammunition Depot.

Navy personnel at the Bangor Depot have been drawing water from a stream on the base for domestic use. Although a sand filter removed foreign matter, the stream water was still brown in color and tasted strongly of iron. The new package plant will produce clear water for drinking and the iron will be eliminated to improve greatly the taste. Pure water processed through the Rotoflow Plant is expected to cost less than the present, sand-filtered water.

Chemicals are drawn into the Rotoflow in precise measure, based on analysis of the water before installation. Once processed, positive filtering action removes all chemical taste. The unique design of the sand filter forces an automatic cleansing of the filter at the time it is required. After approximately seven hours of uninterrupted processing, a backwash cleans the filter within three minutes. The unit then automatically reverts to processing.

The smallest Rotoflow unit can pump 300 gallons of water per hour, enough for domestic purposes for from 30 to 40 persons. During a short emergency, twice the normal capacities can be produced by hand operation. Units are completely self-contained. Installation requires only a firm, level area, water connections and electrical power.



Water Demand Meters Show Results

ROBIN E. MIDDLEMAS
Supervisor,
Water Meters and Services,
Milwaukee Water Works

DEMAND rates are assessments for water use in addition to the commodity charge. These rates take into consideration the customer's demand for water as well as the quantity used. The demand charge, established by the State of Wisconsin Public Service Commission for the Milwaukee Water Works in 1957, provides that a customer billed on the demand rate basis will be assessed the standard commodity charge plus an additional charge based on the largest single hour's use in excess of that for the annual average hour. A customer whose water requirements are large and vary considerably creates a burden on the plant facilities of the utility. This is especially so if the customer's demands parallel those of other large users. Considerable extra capacity must be built into a plant to accommodate these large users. The demand rate is designed to assess these customers that portion of the cost required to develop and maintain the extra capacity plant facilities needed for them.

With the inception of the extra capacity charge or demand rate into the Milwaukee Water Works' rate schedule, the problem of accurate and continuous recording of a customer's rate of flow arose. Initially, portable recording pitometers were used to determine the rate

of flow. Various difficulties were experienced with their use which contributed to the possibility of inaccuracy in determining results, and a delay in receipt of demand data. The pitometer charts were the circular type graduated into 15-minute intervals for a 24-hour period; flow data were transcribed with an ink-fed stylus; calibration of the instrument was necessary periodically. The instruments also required daily chart changes. Since the interpretation of charted data and mathematical coefficients are necessary to calculate rate of flow data from pitometer recordings, correctness of these data relies largely upon the skills of the individual interpreter. Accumulating several rates of flow from various sources of supply to one customer onto a single chart was impossible with the pitometer recorder. Customer acceptance of the demand data had to be considered. To maintain goodwill, the utility used conservative interpretations for peak hour determinations.

The necessity for new demand metering equipment was evident. Impetus was added by rising water rates; an increase of 26 percent has been experienced since the extra capacity charge started in 1957. Currently, the Milwaukee charge is established at \$5.70 for each 100 cubic feet of extra capacity required. New equipment must be efficient, accurate, and compatible for the customer. It must provide easily interpreted data, operate un-

attended, and have all-weather operating capabilities. Also, it should be able to accumulate and record the summation of rates of flow measured in various services supplying one customer. The Badger Meter Manufacturing Company contracted to design and build a demand recording meter to meet these specifications.

Installations

The new equipment met the specifications set forth by the Milwaukee Water Works. Flow data from separated services were telemetered to the demand meter and summation of the individual rates of flow was accomplished to provide a total rate of flow recording on one punched tape. The equipment was calibrated to provide for a recording punch-out every 15 minutes. Basic components of the demand meters consist of an impulse generator attached to the recording head of a regular water meter, a series of electrical telephone-type relays to receive, hold and transmit the pulse signal to the recorder and a digital demand recorder made by Fischer and Porter Co. The transmitting end of the demand meter; and the relay mechanisms and digital demand recorder are illustrated below. An article, "Demand Rates and Metering Equipment at Milwaukee," *Journal, AWWA*, October 1960, by Arthur Rynders, Superintendent, Milwaukee Water Works, contains additional information concerning the demand

meters and their installations. At present they are installed only in lines serving the suburban wholesale customers. These are the Villages of Shorewood, Whitefish Bay, and Fox Point, and the Cities of West Allis and Wauwatosa. The equipment was installed in weather-proof welded steel housings erected at a site most convenient to the customer's point of supply.

Timing sequence of the component parts was the most important factor determining reliability of the recorded information. The punch-out tape is limited to the number of digits available for recording; the tapes used have a maximum count of 500 units. The frequency of pulses for any 15-minute punch-out period must be kept below 500. This is accomplished by calibrating the pulse generator relative to the maximum capacity of its companion water meter and the number of meters connected to the demand meter system. Each pulse

generated is transferred to a memory or lock-up type relay where it is stored. A scanning mechanism, which is similar in operation to an automobile distributor, signals the memory relay to release its stored pulse into the digital demand recorder circuit where it is counted. The scanning device and memory relay circuits discipline the demand recording system whereby "out-of-phase" pulses from various meters are controlled and channelled in a consecutive order to the recorder for counting and totalization.

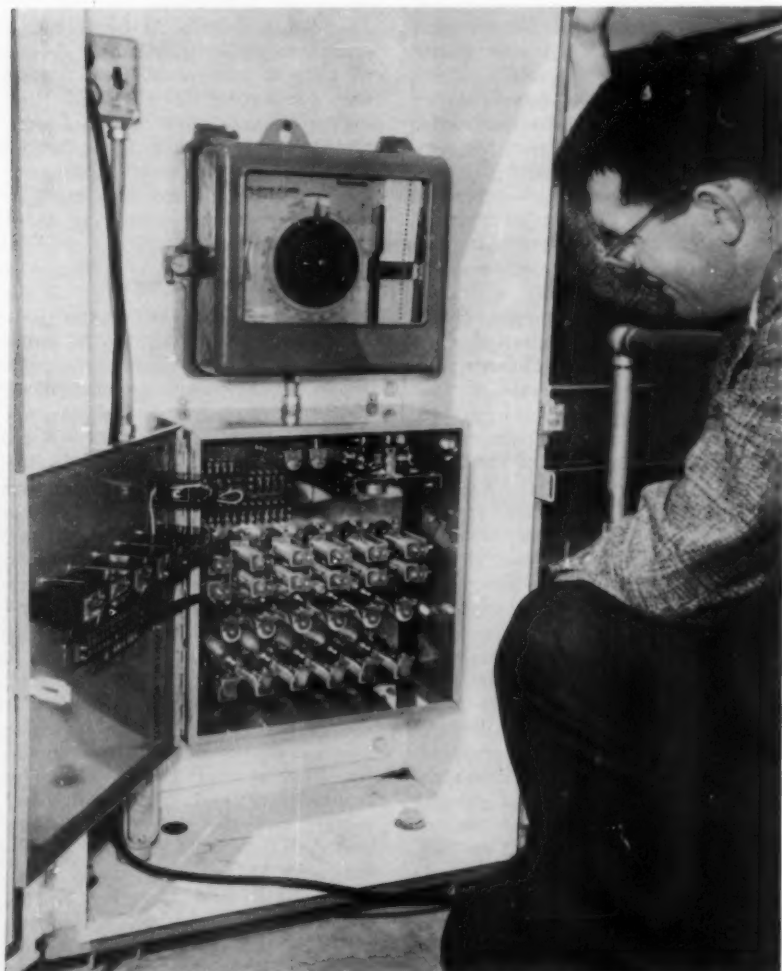
Demand data are recorded by punch marks on a continuous tape. Instantaneous demand data is available to an operator through observation of the tape while it is in the meter. It is possible to telemeter the punched-out data from the demand meter to any other or any series of digital demand recorders located at control points in a system. One suburban consumer has provided additional storage facili-

ties; and, with the instantaneous demand data available, has been able to control demand during high consumption periods, lower its peak hour demand, increase its average hour consumption and consequently reduce its extra capacity charges. During the peak day of the 1961 summer season for the Milwaukee area, every suburban consumer established a new peak hour except the aforementioned customer. The savings gained by that customer will amount to about \$1100 per month.

The demand curves which follow represent pumpage of the Milwaukee Water Works for August 22, 1961, and consumption of two suburban communities for the same date. Community "A" represents a population of 68,157 having industrial, commercial and residential accounts; while Community "B" represents a population of 15,990 having generally commercial and residential accounts. Community "A" utilizes storage facilities whereas Community "B" does not. The ratios of peak hour demand to average annual hour consumption for Communities "A" and "B" are 2:1 and 4:1 respectively. Storage facilities obviously assist in reduction of a consumer's demands. Community "A" effected the reduction of peak hour demand as previously mentioned.

Maintenance

The demand meters were installed in the spring of 1960. Functionally the equipment performed as it was designed. However, there were operating difficulties such as usually attend new mechanisms, mainly adjustments and minor corrections. Mechanically, trouble was experienced with the change gears and upper drive spindles of the water meters. Tolerance and fit of parts in the transmission assembly housing the meter register and impulse generator were too snug and required more drive torque than the change gears and spindles could sustain. The fault was easily corrected by increasing clearances where necessary. Electrically, trouble localized itself in the adjustment of the relays to maintain proper cycling. The relays are a multiple contact type, and since the demand-pulse transmission to the recorder is a sequential operation, it is imperative that each relay contact be closed in phase with its circuit to maintain the electrical continuity required. These adjustments were made in the field without difficulty by visual observation



● MAXIMUM demand digital recorder system will handle up to six meters feeding data into one chart recorder. Any or all of these can be telemetered over leased lines.



● DEMAND meter showing transmitting end which is a gear box housing meter register and impulse generator.

of the relay operation and subsequent manual adjustment.

Maintenance patterns have begun to evolve after two years of operation with the demand meters. Operational problems to date have been wear in the change gears of the water meters and contact erosion in the relays. The maintenance required is a procedure of parts exchange. The change gears should be changed on an annual basis. This can be done without extra effort by the utility since the suburban meters have always been scheduled for an annual test and maintenance program. The change gear wear is attributed to the increased drive torque developed from driving both an impulse generator and meter register through a transmission assembly. The gear wear is not gross, but rather than chance an inconvenient failure, a programmed preventive maintenance annual gear change appears more practical and inexpensive. In the relays, contact erosion causes malfunction. Correction was made by readjustment of the relay contact settings. Experience indicated the relays would operate reliably for about three to six months after an adjustment. Readjustment became more of a nuisance than a problem. In view of this, a complete change of relays from the standard duty contact type to the heavy duty contact type was made during June, 1961. To date, after initial adjustment, the new relays have been faultless. These are capable of a mechanical life of 100,000,000 cycles, or equivalent to about ten years of demand meter life. This ten-year life is speculative; however, long trouble-free service should result with a mini-

mum of tune-up maintenance adjustment necessary only on an annual basis.

Air Conditioning Demand Control

Control of water demand through assessment of non-conserved water consuming air conditioning equipment connected to the Milwaukee Water Works system was also initiated in 1960. The assessment was established at \$10 per ton for each ton of non-conserved air conditioning in excess of three tons, for each water service account. Installations made before February 17, 1958, were exempt from the assessment for ten years from that date. Accounts to be assessed were determined by a field investigation program. The work of inspection and registration was done pursuant to instructions set forth in the State of Wisconsin Public Service Commission Order 2-U-4641.

Results of the inspections for installation made before Feb. 17, 1958, showed 267 conserved units with a total tonnage of 10,917.5; and 3,859 non-conserved units with a tonnage of 34,159.06. The 4,126 installations had a tonnage of 45,076.56. Installations made after Feb. 17, 1958, totalled 156 conserved units, with a tonnage of 4,287.36—a total of 1,154 units with a tonnage of 8,518.16. The water cooled air conditioning tonnage installed in the system amounts to 53,594.72 tons in 5,280 units.

Non-conserved water-cooled air-conditioning installations aggregating three-tons or less are exempt from assessment of the air-conditioning demand charge. Registration data of units three tons or less are as follows: Before Feb. 17, 1958, 1,402 units with a tonnage of 3,562.67; and after Feb. 17, 1958, 623 units with a total of 1,242.66 tons.

Water-cooled air-conditioning used for product control is exempt from demand charges. Installations in this category are as follows: Installed before Feb. 17, 1958, conserved 21 units, 385.5 tons; non-conserved 152 units, 1,891.25 tons; after Feb. 17, 1958, non-conserved, 43 units, 282.5 tons.

A group of miscellaneous water-cooled air cooling units were inspected. These were primarily of the radiator-fan type unit, all made prior to February 17, 1958. An equivalent air-conditioning tonnage factor has not been determined for any of the units so registered. There are 217 of these miscellaneous water-cooled radiator-type installations.

Registrations and inspection of air-conditioning equipment installed during 1961 showed 150 units. Categorized by size, tabulation of these installations are as follows: Non-conserved—3 tons or less, 36 units, 94.5 tons; 3 to 7½ tons, 60 units, 372.5 tons; 7½ to 15 tons, 8 units, 100 tons; 15 tons and over 6 units, 182.5 tons. Conserved—40 units, 2,150 tons.

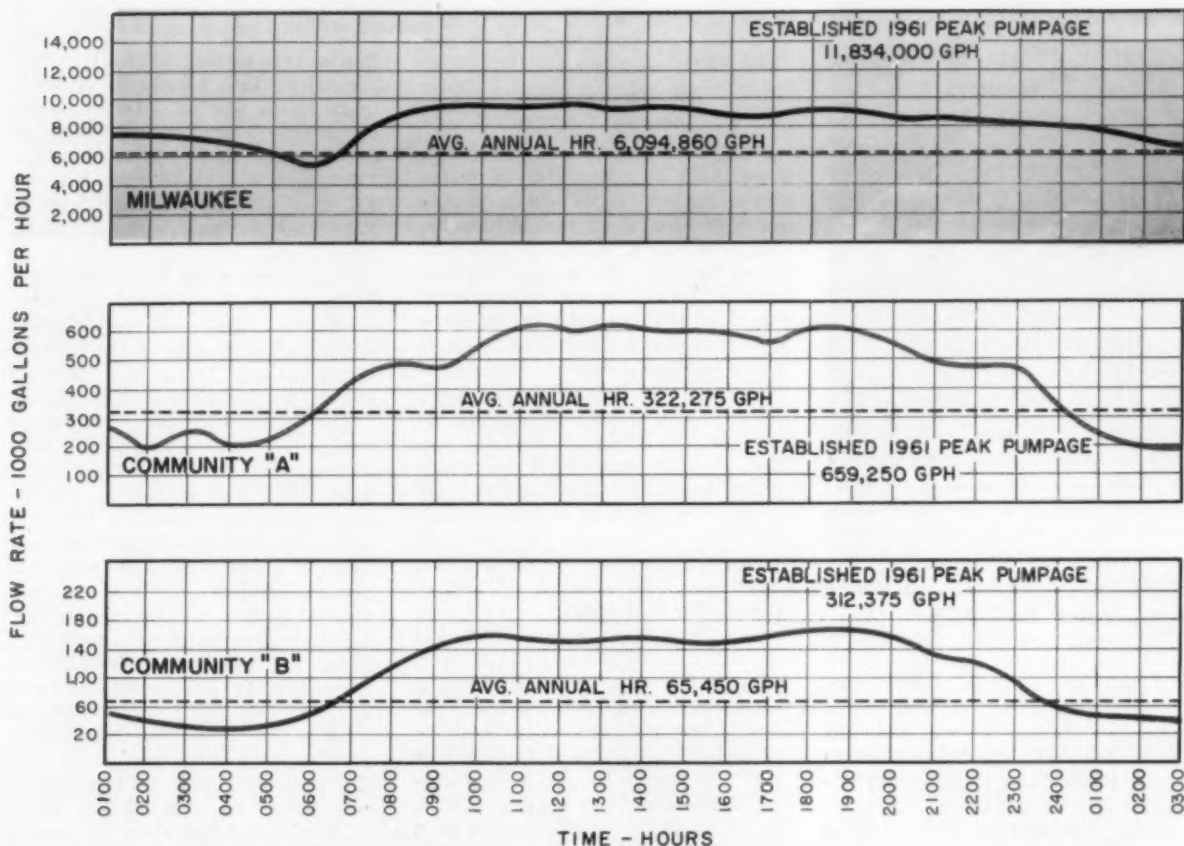
Three large office and commercial buildings in the downtown area converted their air-conditioning equipment from city water to river water cooling. There were 29 units so converted, with a tonnage of 324.

The conserved air-conditioning equipment installed during 1961 averages about 54 tons per unit, while the non-conserved equipment averages about 6.5 tons per unit. The averages for tonnage per unit of conserved and non-conserved installations between February 17, 1958, and January 1, 1961, are 27 tons and 4.3 tons respectively. Also, the number of installations from 1958 to 1961 averaged about 385 per year compared to the 150 units installed in 1961. Totalization of other than water-cooled air-conditioning equipment installations was not of material interest. However, the marked drop in annual installations during 1961 indicate considerable air-cooled equipment is being installed in lieu of water-cooled equipment. This is corroborated by the field inspectors, who indicate they have observed more air-cooled equipment being installed.

Conservation of water-cooled air-conditioning equipment to exempt an installation from the \$10 per ton assessment becomes an economic factor for the water customer. Initial cost of conservation equipment and subsequent maintenance expense must be weighed against the anticipated savings gained by conservation. In the case of units less than 15 tons, the equipment depreciation and maintenance expense of water conserving equipment exceeds the assessment expense. Only large systems provide economy through conservation. Indications to date tend to show that the water-cooled air-conditioning tonnage assessment helps curtail promiscuous use of water for human comfort purposes.

Demand Control with Sprinkling Regulations

Unlimited lawn sprinkling by all water customers will present a heavy demand for any utility. Principally, the residential consumer is



● DEMAND curves for a typical summer day show the Milwaukee water works pumpage compared to two suburban consumers.

responsible for the sprinkling demand. Milwaukee is essentially a city of homes as opposed to apartment and commercial dwelling establishments. As such, the utility pumpage is about equally divided between residential and industrial-commercial consumers. Special assessments and/or metering for lawn sprinkling or other domestic irrigation purposes would be impractical. This demand is seasonal and in general is considered a normal water use. Regular water rates are established on this premise and additional assessment would undoubtedly result in ill-will on the part of the consumer.

Sprinkling demand must be recognized by both consumer and producer. Providing for unlimited sprinkling activity produces an argument of plant cost versus water rates. Some mediatory regulation is necessary to provide control and prevent a runaway demand condition. This has been established in Milwaukee by the local governing body establishing an ordinance which regulates sprinkling to alternate days for each side of the street. Sprinkling is allowed for the street side where house numbers coincide

with the numerical order, odd or even, of the calendar. Customers are thereby treated fairly and the utility achieves a demand control.

Peak Demands

The highest demand day in 1961 for Milwaukee occurred on June 29th. The temperature rose on this date to 93 degrees for the third consecutive day. Pumpage totalled an all time high of 263.8 million gallons. Interestingly, an almost duplicate hot weather condition developed during the first week of September when a series of above 90-degree days ended on Friday, September 8th. The high pumpage day for this period was Friday, with a total of 215.24 million gallons. One marked difference in consumptive use between June 29th and September 8th was sprinkling activity. Being the end of a summer season the growing period for grass and plants is over and property owner enthusiasm for lawn and garden care has waned.

Demand control assists the utility in providing good service to all customers. Any system regardless of size has a physical limit beyond which it cannot function. Stresses

must be kept within this limit to prevent failure. In the case of the water utility its source of supply, productive capacity and distribution ability determine the capacity limit. Aside from source, the utility invests in plant costs for production and distribution. Commodity rates are determined from these plant costs. Each customer is expected to pay for his share of the plant required to supply him. Certain customers need large plant facilities to meet their specific demands. The cost of this extra plant capacity is most fairly received from a demand charge. The demand charge exacts a penalty on the customer for excess usage. Also, through conservation methods the customer can effect savings for himself. The demand meters in Milwaukee provide continuous visual recording of a customer's demand, eliminating guess work operations in control of this demand. Water-cooled air-conditioning, with the assessment, becomes an expensive luxury for the consumer unless conserved. With minor sprinkling controls the Milwaukee Water Works and the customer share in the effort of providing water for everyone. □□□

Report on Experience with MEDIAN BARRIERS



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and

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● TWO TYPES of median barriers were tried out on California Freeways. This shows a chain link fence or "cable" barrier installed on the Nimitz Freeway near Oakland.

TWO TYPES of median barriers were developed and tested in the summer of 1959 for use on California freeways. These were the cable-chain-link fence barrier, hereafter referred to as "cable," and the double-blocked-out metal beam barrier, hereafter referred to as "beam."

In order to compare the performance of the two barrier types, early construction contracts were split, with some of each type in each contract. One test section was on the Santa Ana Freeway in Los Angeles where 3.17 miles of cable barrier were erected end-to-end with 2.57 miles of beam barrier, and the other test section was on the Nimitz Freeway in Oakland where 3.87 miles of cable barrier were erected end-to-end with 2.87 miles of beam barrier. Before-and-after accident records on these test sections have been examined and the results of the study are given in this report.

Head-on accidents were virtually eliminated by the barriers. On the Santa Ana and Nimitz test sections, there were 49 cross-median accidents in the "before" period, including 8 fatal accidents, and there were two cross-median accidents in the "after" period, one of which was fatal. Total accidents and injury-accidents increased in the locations where barriers were installed. There were only 8 fatal accidents, however, in the "after" period as compared to 12 in the "before" period.

The freeway test sections with the cable barrier experienced a smaller increase in the over-all accident



● USE OF median barriers results in overall increase in accidents, except on heavy traffic roads, but reduces severity.

rate than did those with the beam barrier. There was no proof that the accidents involving the cable barrier were less severe. However, the findings of the impact tests indicated that in high-speed collisions the cable barrier would result in much less severe injury to vehicle occupants and it is believed that in the long run the accidents involving the cable barrier would be less severe.

A sports car has gone through the cable barrier and two vehicles have gone over it. It is expected that the current series of crash tests will solve the problem of vehicles going over this barrier.

The maintenance cost of the cable barrier is considerably higher than that of the beam barrier, while first cost of the beam barrier is much greater than the cable barrier. It would require some 19½ years to equal the difference in construction costs without considering the 60 percent of the barrier damage costs which are recovered, and nearly 50 years when recovered damages are accounted for.

More accidents involve the cable barrier. The proportion of single-vehicle accidents is much higher with the cable barrier than with the beam barrier. There is no indication that drivers are more reluctant to swerve into the beam barrier, but there are indications that there may be more "hit-and-drive-away" accidents involving the cable.

There was little difference in the barrier accident rate between the sections with 12 and 22 foot medians, and the maintenance cost per mile was essentially the same. There was no evidence to indicate that the deflection of the cables would be a

problem by permitting momentary encroachment in the opposing lanes.

Effectiveness of Barriers

Both types of barrier have proven effective in accomplishing the purpose for which they were designed. They have been struck hundreds of times, and only two head-on accidents have occurred at locations where they are in place. Two vehicles climbed or jumped clear over the barrier. A new series of crash tests, using heavier vehicles and 75 mph speeds (instead of 60 mph speeds used in the original tests) are now under way in an effort to make the design even more fool-proof.

As described in the introduction, test sections of both types of barrier were erected on the Santa Ana Freeway and the Nimitz Freeway in order to compare the effectiveness of the two types of barrier.

Although there is no way of being sure that the differences between sections are attributable solely to the difference in type of barrier, it was thought that as many extraneous factors as possible would be eliminated by an end-to-end comparison on the same freeway where traffic volume remains approximately uniform, and, in fact, the very same vehicles pass by first one type of barrier and then the other.

Comparisons between cable barrier on one freeway and beam barrier on another should be interpreted very cautiously, because there are so many other potential variables which could affect accident rates that the difference owing to type of barrier can be smothered in irrelevancies.

The barriers have generally resulted in an increase in over-all accidents, except on the Hollywood Freeway where the volume is 190,000. An earlier study had indicated that barriers would increase accidents on roads where the volume is less than 130,000.

The ratio of all-accidents to injury-accidents lies in the expected range of 2.2 to 2.8 in the before and after samples for both types of barrier in the test sections. This is significant in that it shows that the increase in reported accidents is not comprised of mere fender-benders or fence-scrappers.

Accidents Involving the Median

Although head-on accidents were virtually eliminated by both types of barrier, in general there was a rise in accident rates where the barriers were installed on freeways having traffic volume less than 130,000 vehicles per day. One explanation, of course, would be that without a barrier many vehicles are able to encroach on the median without suffering a reportable accident, whereas after the barriers are installed, they strike a barrier.

Maintenance Costs

The annual cost per mile of \$2,078 for the cable barrier was 2.9 times the \$720 per-mile cost of the beam barrier. With a \$1358 per-mile difference in the annual cost of barrier repairs, it requires 19½ years for the damage cost of the fence barrier to equal the difference in construction cost between the two barriers. However, it should be noted that approximately 60 percent of the damage costs have been recovered,

hence the actual difference in the maintenance costs to the State was \$540 per mile. At \$540 per mile per year, it would require 49½ years to make up the difference of \$26,700 per mile in initial cost. Details are given in Table I.

More important than cost is the hazard to both maintenance workers and the traveling public of continual maintenance in the median. There is also a certain amount of congestion caused by such operations. In this regard, comparison of the two types should include the bulkiness of equipment and size of crew required, and the time per job, as well as the number of repairs required. The width of median is also important in this respect.

This report covers a limited amount of experience which has been had during the year following initiation of the barrier construction program. Although there are indications regarding the effectiveness of the barriers, both in preventing cross-median head-on collisions and in increasing over-all accident rates, the experience so far should be interpreted with caution and only tentative conclusions should be made at this time. Additional data are being accumulated covering more extensive sections of barriers over a greater period of time. It is planned to continue the investigation. In the meantime, barriers are being installed on all 8-lane freeways and on freeways where the average traffic exceeds 60,000 per day. It has been shown in the 1959 study and confirmed by 1960 experience that four-fifths of all the cross-median, head-on fatal accidents occur on these high-volume freeways. □ □ □



● SECOND type of barrier is the double blocked out metal beam—the "beam" barrier. This view of partly completed beam barrier shows many details of construction.



● CABLE barrier appears to have come off second-best; however maintenance costs are not excessive and about 60% of the barrier damage costs have been recovered.

Table I—Cost of Barrier Repairs for One Year as Reported by Maintenance Department

Cable Chain Link Barrier							
Freeway	Length	Million Vehicle-Miles	No. of Repairs	Total Cost (One Year)	Cost Per Repair	Cost Per Mile-Year	Cost Per MVM
Nimitz	3.87	131.65	91	\$ 6,879.53	\$ 75.60	\$1,777.66	\$52.26
Santa Ana	3.17	117.21	60	7,848.16	130.80	2,475.76	66.96
Sub-Total	7.04	248.86	151	14,727.69	97.53	2,092.00	59.18
Ventura	2.35	78.06	43	4,782.00	111.21	2,034.89	61.26
TOTAL	9.39	326.92	194	\$19,509.69 ^(a)	\$100.57	\$2,077.71	\$59.68
Blocked-Out Metal Beam Barrier							
Nimitz	2.87	101.30	37	\$3,658.41	\$98.88	\$1,274.71	\$36.11
Santa Ana	3.29	127.66	21	1,205.26	57.45	366.20	9.50
Sub-Total	6.16	228.96	58	4,863.67	83.90	780.00	21.25
Bayshore	1.43	53.42	4	599.88	149.97	419.50	11.23
TOTAL	7.59	282.38	62	\$5,463.55 ^(a)	\$88.10	\$720.00	\$19.35

(a) Approximately 60% of this was recovered from vehicle owners whose cars damaged the barrier.



● HEATING CABLES were placed on two lanes of a heavily traveled bridge approach on this New Jersey highway.

Pavement Heating Experiment

ONE OF ITS most heavily traveled trunk routes is now being readied by the New Jersey State Highway Department for a winter-long official study on the feasibility of electrically heating roadway pavements to keep them free of ice and snow. Scene of the test will be the 5-lane Route U. S. 1 & 9 (Truck) Passaic River Bridge and its west approaches where over 42,000 vehicles a day cross the Jersey meadows within the shadows of New York City.

The entire test area is completely exposed to severe weather conditions. It has been the scene of weather induced traffic tie-ups in past winters when icy approaches did not offer sufficient traction for traffic to get underway again after having been halted on the long up-grade leading to the bridge to wait passage of boats through the vertical lift draw-span. Merging traffic from a New Jersey Turnpike exit also has offered complications to the steady free movement of traffic through this stretch of highway under adverse weather conditions.

The test site is 840 ft. long and covers the two 10-ft., wide east-bound traffic lanes. Approximately 710 ft. will be on the roadway approaches to the bridge and the balance on the first bridge span. Here the physical installation on the roadway has been carried out in conjunction with a bituminous concrete resurfacing of the bridge deck and approaches.

The work was carried out over two week-ends during the small hours of the morning when traffic volumes on the highway were at their lowest ebb. Installation of control equipment and connection to power supply will complete the job.

The procedure was to lay a 1½ inch bituminous concrete leveling course, position heat conducting cables and tack them to this base, place a sand mix black-top course to fill the area between cables, and machine-lay the final 1½ inch bituminous concrete surface course.

A department designed rig pulled behind a rack-bodied truck adapted to the job was used to place the cables on the 710 ft. land-fill area in parallel lines 4 in. apart over the entire length.

On the first pass, the rig carried fourteen double wound reels, laying fourteen pairs or loops and covering one lane. On the second pass, the rig carried thirteen double wound reels, laying thirteen pairs or loops and covering the second lane.

Each heating unit consisted of 1,420 ft. of single conductor heating wire with suitable lengths of cold conductor connected to each end. The cold conductors were laid in a 4 in. by 6 in. slot cut across the concrete roadway in order to bring them over to the sidewalk area for connection to the electrical distribution panels.

As the cable laying rig proceeded down the roadway, the cables were

sealed in proper position by applications of joint filler compound at 4 ft. intervals. A ½ in. cover of sand-mix asphalt was then hand spread over the cables and compacted with a five ton roller. The final 1½ in. of bituminous concrete was then laid in the usual manner with a paving machine and compacted with a 10 ton roller.

The installation on the 130-ft. section of the viaduct span consisted of nine units of single conductor cable, each 920 ft. long. These units were laid by hand, using fixed templates at either end of the section to form and secure the bends. Each unit consisted of seven passes. The cold conductor at one end was laid in the same slot with those on the land-fill area and the other cold conductor taken down through a hole drilled in the bridge deck.

These units were similarly secured by the application of joint filler prior to removal of the template. After removal of the template, the loops were sealed down and the paving operation proceeded in the same manner as on the land fill.

Two thermocouples, one for the land fill section and one for the bridge area, have been installed to enable the department to determine actual highway temperatures.

The department expects to maintain a manual control for the early portion of the test period, and later plans to provide thermostatic controls for automatic operation of the test site. □ □ □

Small Filter Plant

Treats Hudson River Water

THE HIGHLAND Water District plant at Lloyd, N. Y., is an automated, rapid water purification plant drawing water from the Hudson River, which is approximately 260 feet below the town. The plant serves a population of some 3500 people in an area of 3 square miles.

Water from the river is drawn in through a 16-in. pipe, the outer end of which is approximately 200 ft. from the shore. Two low-lift pumps of 1050 gpm capacity draw river water to a Permutit Precipitator, a high-rate clarifier with a motor driven agitator. In this unit, alum and lime are added by Wallace & Tiernan chemical feeders to coagulate suspended matter in the raw water. Chlorine is also added here. The water then goes to settling or detention tank where it is held for two hours and more chlorine is added as a precautionary measure. This detention tank is so designed that it could quickly be converted to a second precipitator if expansion of the facilities becomes necessary. After sedimentation the water goes to two Permutit rapid sand gravity filters. The filters are rated at 350 gallons per minute each (two gallons per minute per square foot of filter). Water flow from the filters is regulated by two Permutit-

Simplex rate-of-flow controllers. From the filters, the water goes to the clearwell, where it receives a small additional dosage of chlorine before it is lifted some 260 ft. to the distribution system in town. Chlorinators are by Wallace & Tiernan.

Operation of the filters is monitored by a Permutit automatic filter operating console, equipped with pneumatically operated valves. Gauges give indications of the rate of water flow through the filters and loss-of-head indicators tell when the filters must be backwashed. The backwash process is controlled by special Permutit-Simplex rate-of-flow controllers. Wash water is discharged through a separate line to a waste lagoon.

The entire treatment plant is controlled by a Permutit system that regulates the rate of water flow through the plant in relation to the demand from the community. An increased demand lowers the level of the water in the clearwell storage tank, which automatically causes a stepped-up rate through the filters within the design rate of filtration. This in turn relays an increased demand to the Precipitator, where flow of incoming water and clarification action is immediately increased.

Results of treatment are indicated by the reduction in turbidity from 40 to one mg/L; in color from 20 to 4 mg/L; and in iron from 0.6 to less than 0.03 mg/L. There is no taste nor odor; pH remains at 7.0; hardness is increased from 68 to 92.

The Lloyd water supply serves as an example of what a community can do to supply safe, clean water by applying modern methods of purification to water supplies that have for years been considered substandard and useless. Four years ago, at the end of a period of drought that saw Lloyd without water, Civil Defense emergency units pumped Hudson River water uphill to the empty reservoir above the town. Until this happened, most of the 3500 citizens of Lloyd had considered Hudson water as best left to the fish and the steamboats; but when the emergency ended, citizens reflected that no one had suffered from the once-disdained river water, and plans to make it a regular source got under way.

First, however, the supervisors of the Highland Water District, which serves the town, had to find out if the river at this exact point was a good bet as a permanent source. The Hudson is a strange and erratic stream, still heavily influenced by



● INTERIOR of plant, showing instrument and control panels with the two steel tank circular filters in the background.

salt tides that push up from the New York Bay area. At certain points, even upstream from Lloyd, salt water can be found; the heavier salt water also makes gains along the bottom, "undercutting" the lighter fresh water overhead.

Harry Edinger, Public Health Department engineer for Ulster County, made a series of tests of the river water to determine its physical and chemical makeup and the bacterial content at various stages of the river. Purpose of these tests

was not so much to determine whether or not the river water was dirty—everybody knew that; but the laboratory tests indicated that with proper treatment, the water would be acceptable.

The matter now became one of public approval and financing. John Gaffney, Supervisor of the Town of Lloyd, and the Town Board held a hearing at which the new plan got public support. This was followed by a referendum at which a bond issue for the new plant was voted.

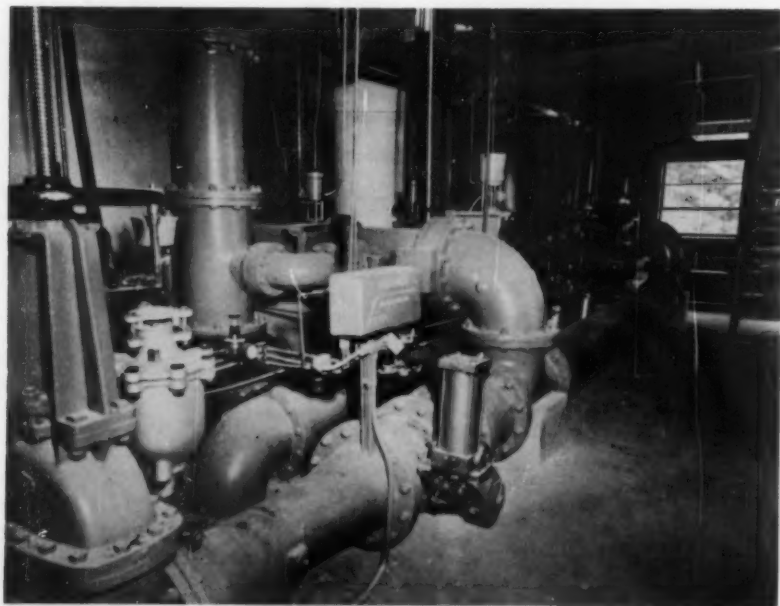
By the autumn of 1958, Brinnier and Larios, consulting engineers of Kingston, were preparing the plans.

Automation and the use of new and improved processes and equipment were desired; also the engineers decided to confine equipment as nearly as possible to a single manufacturer (at that time not yet selected) so that one firm would be responsible for all equipment delivery and for plant performance. The Permutit Division of Pfaudler Permutit Inc., was selected as the supplier of the clarifier, filters, and the unified and automatic control system. This was somewhat of an innovation in water works building procedure, but it paid off.

The firm of Anthony Costanzi Co. of Kingston was successful bidder on construction of the treatment plant at a cost of \$271,600—a rather low figure for the modern, automated plant that can turn Hudson river water into clear, safe drinking water at a rate up to 1 million gallons per day. □ □ □



● TREATMENT plant for Hudson River water. Precipitator is the large tank in center of picture. Filtration and additional chlorination are provided in building.



● PUMP room at the Lloyd plant. Present capacity is 1 MGD, well above usage. In designing plant, consulting engineers provided for possible future expansion needs.

5-Man Crew Applied 125 Miles of Striping Paint in One Day

Setting what may well be a record in road striping, a Mansfield, Ohio, road-marking firm headed by J. W. McCormick recently laid down 125 miles of painted line on New Jersey roads in a single day.

A five-man crew applied almost 2,000 gallons of traffic paint in the effort. Using specially-developed equipment, the crew was able to apply the paint almost continuously, with only minimal stops to replenish the paint and glass bead tanks on the truck used in the operation. Supplies were hauled directly from the Gibbsboro plant of the Sherwin-Williams Co. in a tank wagon. Transfer of the material to the striping truck was done on the highway.

The marking truck is equipped with a sighting boom and dual striping controls and guns to permit operation on either side of the highway. Glass reflector beads are deposited automatically. As the truck moves down the road, rubber marking cones are dropped on the freshly-painted line by an operator seated on an outrigger. Following at a distance of four to five miles (depending on drying conditions) another operator, seated on an outrigger on an auto-drawn trailer, retrieves the cones. All vehicles involved in the operation carry bold safety markings.

NO DELAY ON THIS DETOUR

THE SITUATION: Construction schedule held up by bad weather and a critical detour route in impassable condition.

THE SOLUTION: Use of hydrated lime for stabilization of the 1200-foot detour road followed by calcium chloride to accelerate set of the lime. This allowed the detour to be used immediately.

WILLIAM J. GOGGINS

District Highway Engineer,
Massachusetts Department of
Public Works,
Lenox, Massachusetts

LIME STABILIZATION, with accelerated set using calcium chloride, overcame a bad situation that faced Murray Weiner of Gil Wyner Co., Inc. at Lanesboro, Massachusetts in June of this year. A wet spring, followed by an equally wet month of June, made 1,200 feet of Bailey Road impassable and rendered it useless as a detour for traffic using U. S. Route 7. Without use of the detour, progress on the reconstruction of this route was held up and the work schedule suffered accordingly.

Many types of soil stabilization had been used in our area over the last several years. For years, we had used successfully limestone waste for making roadways in the vicinity of lime waste piles. Soil cement, calcium chloride, sodium chloride and asphalt stabilizers, all had certain qualities, but were not considered operations that a contractor could use in a hurry with his own equipment and manpower.

When the situation was brought to the attention of the three local concerns manufacturing lime within a 10-mile radius of Lanesboro, they immediately called in Conard Kelly, Highway Engineer for the National Lime Association, who

tested the Bailey Road Material. He recommended use of 2 percent hydrated lime mixed into the top six inches of the wet, dirty gravel.

The morning of June 22 was just the same as the three previous days had been—rainy. Gravel placed on the detour road was saturated and rutted deeply by heavy construction equipment using the area. The road had been closed the night before because of its dangerous condition.

It was under these conditions that lime stabilization was tried even though the start was made in a heavy downpour. Hydrated lime, furnished by New England Lime Company was already on trucks at the side of the road in waterproof bags. Equipment and workers were standing by waiting for the rain to stop.

Contractor Superintendent Weiner, ready to try anything at this point, decided to go ahead with the trial in the rain, basing his decision on the claims of the lime company. It was now 10 o'clock and still raining.

The first operation consisted of blading the very wet gravel with a motor grader. This was for the purpose of shaping only; the material was very soft and needed no scarifying. Immediately thereafter, the bags of lime were placed in a windrow along the middle of the road. The bags were opened and the lime spread by four laborers working in the rain.



● **DETOUR** after treatment carried much traffic. Lime stabilization was successful. Use of calcium chloride expedited curing.

After the lime was spread, the grader began the blading operation, attempting to mix the lime into the top six inches of the material. By the time the first complete pass had been made, the rain had stopped. Mixing and blading operations continued until 12:30 when work shut down for the lunch period. By this time, it became apparent that the gravelly material was drying and solidifying.

When operations began again at 1 p.m., the set was noticeable enough to cause the New England Lime representatives to advise obtaining a water tank to be sure of sufficient moisture—this after three days of heavy rain.

Two passes of the grader and one pass of wobbly wheel, rubber-tired roller brought the road into shape, but also made it too dry to consolidate properly. At 2:15 p.m., the local fire truck using a fog nozzle was brought in to wet down the road. Two applications of water were used. Continual use of the grader and rubber-tired roller brought the desired results—a dry, well compacted roadway. It was 3:30 p.m.

Set Accelerated

"Now, if you can close it off for five days, you will have a beautiful road." These words were spoken by the lime company representative. The reaction of the writer and Superintendent Weiner will not be quoted here. Any such quotations



● BAGS OF LIME were placed in a row along centerline of the road. Bags were opened and lime spread by crew of four.



● LIME was mixed into the top six inches of road material using a motor grader. More water was added and the mix rolled.

would only have to be deleted. Immediate opening of the road was essential to the progress of the main contract on Route 7.

Superintendent Weiner, seeing the dry condition of the road, suggested the use of calcium chloride. It was agreed by the lime company representatives that such a treatment would accelerate the set of the lime, but they still did not feel that the road should be used for a few days.

Since calcium chloride had been in use for laying dust on the project, it was easily available and was laid down, using approximately 1½ lbs. per sq. yd. by means of a grain drill borrowed from an adjacent farm.



● CORE borings made after two months service under heavy traffic showed roadway was well compacted.

The road was opened at 5 p.m., in time to carry the homeward-bound traffic from industrial plants nearby.

By the last day of August, this stretch of road had been used every day since completion and has carried as many as 3,000 cars per day. No treatment other than the calcium chloride had been placed thereon. An August 29, a core-boring machine, powered by a gasoline motor, was used to ascertain the condition of the top six inches of the surface. It was found to be very solidly compacted to the full depth treated. A 3½ inch-in-diameter hole was bored which took a half-hour to get the full 6-inch penetration. A similar hole bored just off the area that had not been treated by lime and calcium took eight minutes. On August 30 and 31, New England Lime Company representatives, using an electric drill powered by a portable generator, took similar tests with the same results.

In addition to these holes, Materials Engineer, Decensi, of our district office, took a boring at a location a few hundred feet distant. This section had been treated with an application of MC-3 asphalt three days after the lime and calcium had been applied. At this location, completion of the boring required just under 10 minutes.

James L. Eades, research assistant from the Department of Geology at the University of Illinois, took samples of the material at the pit and also took a sample from the roadway surface. His findings, using X-ray, indicated a very complete agglomeration of particles. John Gaisford, chief chemist of the Lee Lime Company, at the request of

President John M. Deely, took a sample from the roadway. With the assistance of District Materials Engineer Decensi, he prepared a test cylinder in the manner of the Bureau of Public Roads Compression-Immersion tests, modified somewhat. At 70 days, the readings were 60 psi for the dry sample and 45 psi for the wet one. Further tests are being made, and the reaction under frost conditions this winter is to be carefully studied.

Our main interest centers on the use of lime and calcium chloride on routes under our state aid road program of which we have 1,578 miles in Berkshire County. By stabilizing the materials found, we hope to better the travel conditions of the entire area which is fast becoming depleted of natural gravel deposits. We must develop other means for keeping out of the mud and the use of lime stabilization and calcium chloride seems to be an answer. □ □

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Public Health Service Needs Sanitary Engineers

Examinations for appointment as Sanitary Engineers to the permanent service in the Public Health Service will be held Feb. 13 to 16 at a number of places. Appointments will be made in the three lowest grades of commissioned offices. At the same time examinations will be given for permanent appointment of sanitarians, also in the three lowest grades. Applications must be made before Jan. 5 and forms are available from the Surgeon General, Public Health Service (P), Washington 25, D.C.

Significance of Detergents in Water Pollution Control

O. JOHN SCHMIDT

Sanitary Engineer,
Black & Veatch,
Consulting Engineers,
Kansas City, Missouri

THE ROLE of detergents in water pollution control has reached its present importance gradually during the past decade or so. Current production of synthetic detergents in this country is about 250,000 tons per year.

A good detergent has been characterized as a material that is soluble in water; permits the water solution to penetrate capillaries by lowering the interfacial tension; breaks up or separates particles that have agglomerated; and links the dirt or oil particles with the water (emulsifying action) rather than with each other or with the substance being cleaned (1).

Many soluble substances exhibit surface-active properties and a significant number of such substances normally appear in sewage. Their presence in sewage has been recognized for a long time and some efforts to evaluate their effects have been made.

Surface-active agents, also termed surfactants, are important in synthetic detergents. They have the property of altering, usually by lowering, the surface or interfacial properties of their solutions to an unusual extent. They combine the important detergent properties of wetting, dispersing and emulsifying with hardness stability.

Surface-active agents may be classified according to their ionization in water as anionic, cationic, or non-ionic. The anionics are by far

the most important commercially and are the ones most likely to be found in streams and lakes receiving water-borne wastes from cities and industries. The anionic surface-active agents are so described because the active portion of the molecule is an anion, having a negative charge; the cationic is so called because its active portion is a cation having a positive charge; and the non-ionic is so termed because it does not ionize. Of the anionic compounds available, alkyl benzene sulfonate predominates in use. For convenience it has been commonly referred to in the literature as ABS.

Synthetic detergents are comprised of various surface-active agents together with certain other organic and inorganic compounds that are intended to improve the detergent action or other properties. These supplementary compounds are generally termed "builders" and include polyphosphates, sodium silicate, and sodium carboxymethyl cellulose (1) (3). Packaged household detergents ordinarily contain approximately thirty percent surfactant material and seventy percent builder material. Heavy-duty industrial detergents contain about twenty percent surfactant.

Synthetic detergents are those which exhibit detergent properties plus stability toward hardness in

water. Although soap is surfactant, it is not regarded as a synthetic detergent because of its lack of stability toward hardness.

In the last two years non-ionic detergents have risen from 10 to 26 percent of the domestic market. At present there is no analytical method available for determining small amounts of non-ionic surfactants in water (4).

Properties of Detergents

Surface Tension. Lowering of the surface and interfacial tension is one of the factors associated with sudsing or foaming. The latter is a complicated phenomenon and many other factors probably influence foam formation tendencies and foam stability. Natural surfactants can be demonstrated by soaking grass, straw or leaves in water. The resulting extracts produce foam and there is a significant lowering of the surface tension of the water.

Adsorption. An increase in the concentration of a solute at the surface boundaries as compared with the concentration in the main body of the liquid is called positive adsorption, and a decrease in this concentration is termed negative adsorption. Most water-soluble organic substances exhibit positive adsorption with accompanying lowering of the surface tension and surface-active agents have this property to a marked extent.

Mechanism of Detergent Action. Substances that lower surface and interfacial tension are attracted to the phase boundary. Dirt particles protected by an adsorbed layer of charged, oriented surfactant particles will have little tendency to coagulate and settle and conse-

This very complete discussion of the syndet problem is a revision of a paper presented before the Nebraska Sewage and Industrial Wastes Association in March, 1961, brought up to date by a careful check of published data appearing within the past year.

quently are in a favorable state for removal. It is this characteristic of synthetic detergents which give them an unusual ability to cleanse. Because this process takes place without being affected by the hardness of the water, detergents are generally more effective than soaps as cleansers.

Analytical Procedures

In the early investigations concerning detergents existing analytical methods frequently were obscured by interferences in the dilute concentrations found in streams and in waste waters. A method was developed, based on infrared techniques, which provides an exact determination of the ABS present. There also has been developed an improved methylene blue test which is generally used as a rough screening procedure. When a high methylene blue result for ABS is found ordinarily it is followed with the more sensitive determination given by the infrared method. However, if the initial test made by the methylene blue procedure shows a relatively low ABS content, under 0.5 mg/L, frequently there is no need to employ the more complicated infrared test which is not suitable for routine use. A series of tests made on Ohio River water, in which both infrared and methylene blue results were compared, showed that at times a ten-fold difference in results occurred (5).

Ten samples were collected at intervals in 1958; the average ABS concentration by the infrared procedure was 0.04 mg/L and that by methylene blue, 0.12 mg/L. The range of the infrared results was 0.01 to 0.12 mg/L, that for methylene blue, 0.05 to 0.22.

Effects of Synthetic Detergents

In Sewage Treatment. Recent measurements of the ABS content in domestic sewage show that it varies from 1 to 10 mg/L (6). There is considerable difference of opinion regarding the effect of synthetic detergents on the efficiency of waste treatment works as expressed in terms of suspended solids or BOD removals. In all probability the loading of particular plants has been an important factor in the effect that detergents have had on such plants.

A new plant with a design capacity that will not be reached for fifteen or twenty years obviously can accept increased waste loadings of treatable materials for some time in the future without showing signs of distress. On the other hand, a

plant whose organic loading now has virtually reached its design capacity undoubtedly would react quickly to significantly increased loadings (7). More than this, where detergents are involved, the characteristics of the particular detergents could appreciably affect the treatment plant efficiency.

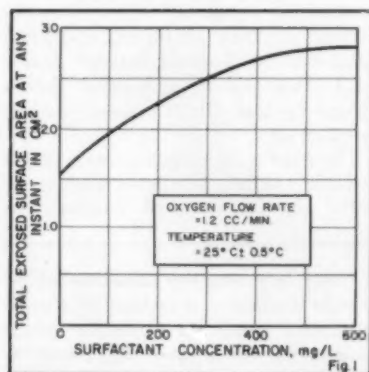
There is still considerable question that syndets have significantly lowered grease removal efficiency in primary sedimentation, careful studies having shown only a slight decrease in efficiency with increased syndet consumption. In this country results of plant efficiency ordinarily are reported in terms of BOD and suspended solids removals, whereas in Europe an additional criteria of effluent nitrification is also considered to be an important measure of the degree of treatment. These overseas reports frequently have claimed ABS interference with nitrification in various plants (7).

Sedimentation. Removal of surfactants in primary sedimentation units is generally considered to be largely a result of adsorption phenomena. Suspended solids removal by primary sedimentation basins is not measurably affected by syndets at present concentrations, or concentrations expected in the immediate future. ABS removals in the primary sedimentation units of conventional treatment works ordinarily range from two to four percent (8).

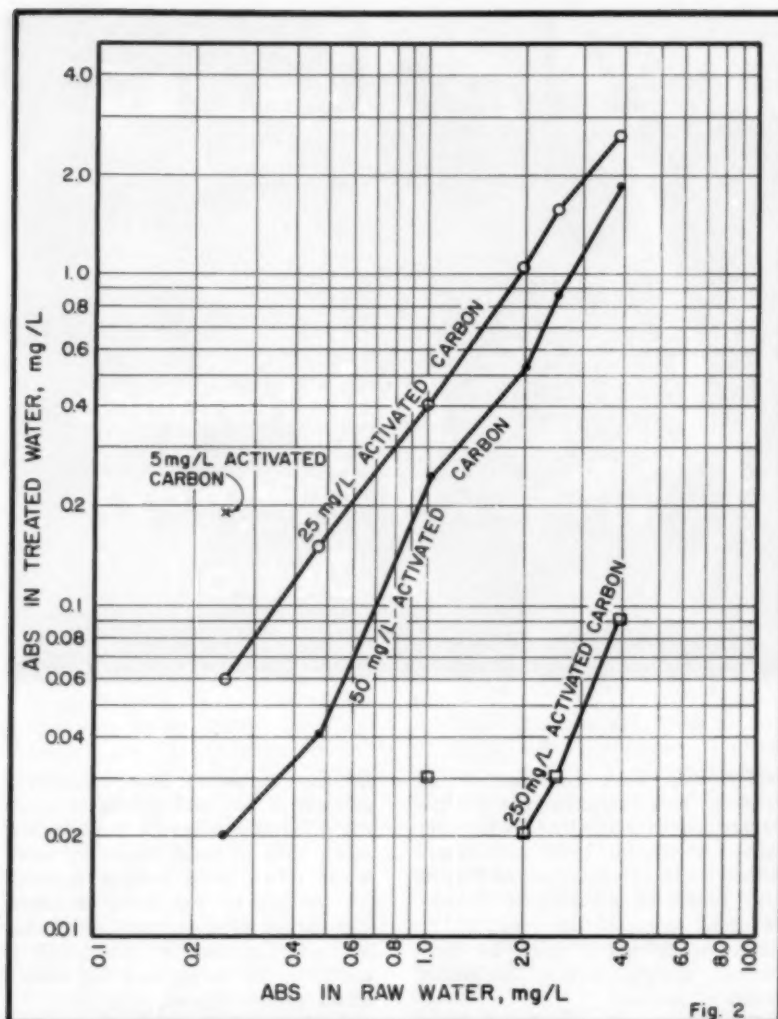
Biological Treatment. In ordinary aerobic stabilization of sewage, part of the organic material is oxidized to carbon dioxide and water and the remainder is converted to new biological cell tissue which can be removed by sedimentation. Many of the surfactants used in syndets are amenable to this type of treatment, but certain others are not. The former are sometimes referred to as

biologically "soft" and the latter as biologically "hard" (7). In this instance "soft" means easily assimilated, and "hard," the opposite. Surfactants which have been found to be biologically hard are of three classes: 1) alkyl benzene sulfonate, particularly the form having a branched alkyl group derived from propylene; 2) alkyl phenoxy polyethylene glycols; and 3) simple high molecular-weight polyethylene glycols. There is little doubt that these compounds are responsible for the principal difficulties attributed to syndets in secondary waste treatment units and receiving waters. It is believed that the new toilet bars containing syndets do not constitute a threat to secondary sewage treatment processes. Reportedly the British have developed a new "soft" type of ABS which is susceptible to biochemical degradation but which still has satisfactory detergent properties. Pilot tests on trickling filters showed 67 percent removal of conventional ABS and 94 percent removal of the new ABS. This is important because ABS is apparently more effective in laundering than other detergents which are more susceptible to biochemical degradation (9). Hurwitz, et al. (10) reported an over-all ABS removal of 54 percent at the West-Southwest works of the Metropolitan Sanitary District of Greater Chicago. This confirms the laboratory studies of McGauhey and Klein (11) that "some 50 percent of the ABS in raw sewage may be removed by an ordinary sewage treatment plant having activated sludge as a secondary treatment process." In spite of the fact that approximately one-half of the ABS present in raw sewage can be removed by primary plus secondary treatment, this is not accomplished without some additional cost. A number of reports in the literature indicate that there have been increased air requirements in activated sludge treatment of sewage since the advent of syndets. It has been known for a considerable time that oxygenation of sewage by either bubble or surface aeration is considerably slower than in the case of clean water. Before discussing the effects of syndets on gas transfer in liquids, it would be wise to recall three basic properties of surfactants: 1) lowering surface tension; 2) accumulation of dirt and other suspended material at phase boundaries; and 3) stability toward hardness.

Lowering of surface tension by an increase in the surface-active agent



● GRAPH showing the change in the total exposed bubble area for a range of surfactant concentration. (Ref. 12)



● REMOVAL of ABS from drinking water by use of activated carbon has been found to be effective, but high dosages are required for good results. (Reference 12.)

concentration causes a higher rate of bubbling in the aeration process. With this decrease in surface tension there is a corresponding decrease in the size of the air bubbles. However, the concentration of impurities such as dirt, surfactant and other suspended material at the phase boundary lowers the gas transfer rate per unit area (12).

As the concentration of surfactant in the liquid increases there is an initial abrupt lowering of the reaeration rate (K_L) which continues until a minimum value is reached after which some recovery of the reaeration rate is observed. This is explained as follows. The oxygen transfer rate per unit area of interface surface (K_L) is reduced, but because of the increase in the number of bubbles produced and their smaller diameter, the total transfer area is correspondingly increased. These two actions are offsetting and

a point is reached where some recovery of the K_L , or reaeration rate, is experienced (12). The change in the total bubble surface area with surfactant concentration is shown on the graph, Figure 1 (12).

Lynch and Sawyer, (13) in their investigation of syndets and oxygen transfer, reported generally decreasing values of K_L with increasing mineral content of the water. They also indicated that pH had no noticeable effect on the K_L factor.

Various investigators have found an appreciable difference in the reaeration rate under quiescent as against turbulent conditions. In general the reaeration constant is lower under turbulent conditions than under quiescent conditions of flow.

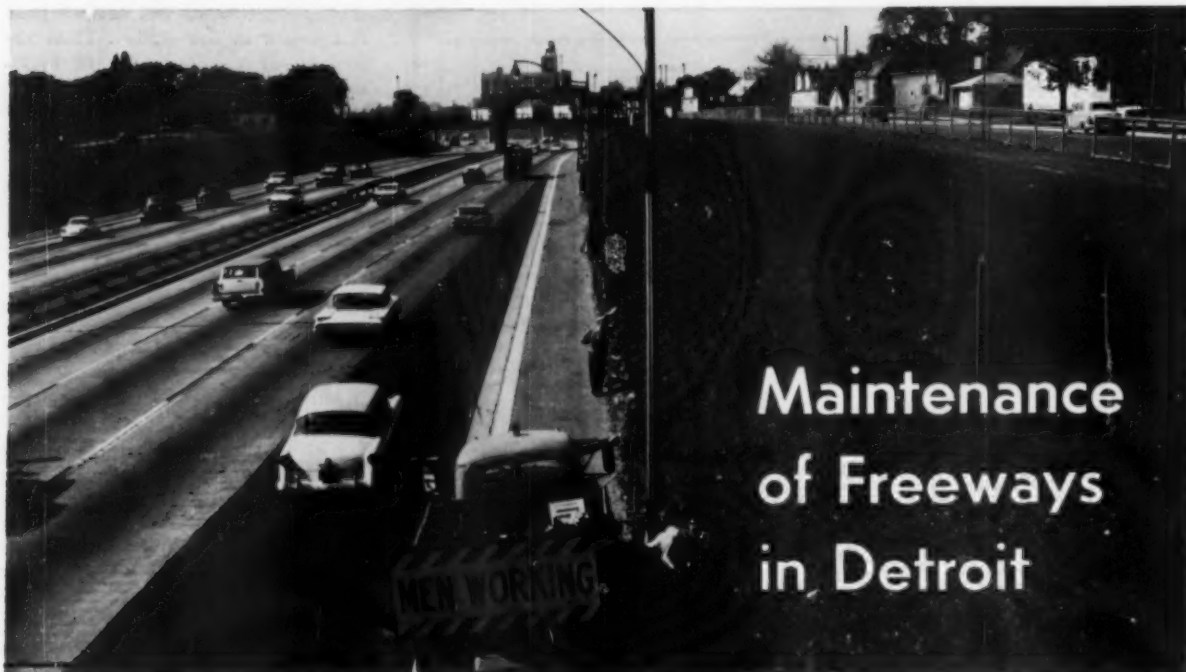
The accumulation of syndets in settled sludge can become a significant item because the syndet concentration in the raw sewage is

multiplied 100 to 400 times when it appears in the sludge. Thus removals of as little as 0.5 mg/L could be expected to produce concentrations of 50 to 200 mg/L in the sludge. There appears to be no evidence that syndets have any detrimental effect on vacuum filtration and there have been no substantiated reports to indicate that syndets have caused trouble in plant-scale digestion units (7).

Frothing. Various workers have reported that surfactants differ widely in their frothing ability. Some fairly high foamers are used in detergent formulations for the specific purpose of increasing sudsing ability in order to please housewives. Others are known to have definite low frothing characteristics. The appearance of froth in sewage treatment plant units and on receiving streams not only is an aesthetic problem, but also has certain effects on the treatment process. The reasons for the production of foam in treatment plants are not well known. It is recognized that many factors, either alone or combined, can contribute to foaming. While ABS may be one factor, low suspended solids concentrations in activated sludge treatment tend to promote frothing while high solids reduce or eliminate it. Protein degradation products, present in almost every domestic sewage, can cause frothing, but in addition, temperatures above 70°F, high pH values, and aeration rates all have a part. Fats, calcium, magnesium and soaps tend to depress frothing. The amount of ABS needed to produce foam is reduced as the soap concentration in the sewage is decreased (7).

The smothering action of froth which prevents reaeration from the water-air surface is regarded as a serious problem in reducing oxygen transfer rates. This is especially true with many mechanical aeration units which depend to a considerable extent on surface aeration. Basically, the magnitude of the frothing problem has been related to the rate at which the anti-foaming materials are destroyed, the concentration of residual surfactants such as ABS, the depth of aeration tanks and the rate of air application (7). One report (14) concludes that the removal of detergents in froth is an equilibrium phenomenon and that the detergent distributes itself between froth and liquid. The distribution depends on such conditions as the air rate and the rate of evaporation of the water in the foam.

(Continued on page 153)



Maintenance of Freeways in Detroit

OTTO P. POMMERENING

Engineer of Highway Maintenance
Wayne County, Michigan

MAINTENANCE of the Detroit Expressway System is performed by the Wayne County Road Commission by contract with the Michigan State Highway Department. Freeway maintenance has gradually developed into a specialized operation. Free movement of the high volume of traffic is of primary concern and it is not uncommon to spend more time placing and removing signs and barricades for work site safety precautions and traffic warnings than is required for actually accomplishing the work.

When it becomes necessary to close a traffic lane at any time, warning signs, spaced at half mile and mile intervals ahead of the job, designate which lane is closed and give drivers sufficient time to filter into adjacent lanes and prevent a tie-up at the barricade. Warning signs, cones and flashers are placed well in advance of all stationary work done on the expressway.

The normal operations of surface repair, drainage correction, sign replacement and similar items must be performed on a preventive maintenance basis in an attempt to alleviate conditions before they become a nuisance or hazard to the travelling public. So that rush hour

traffic may have full use of all roadway lanes, maintenance work is performed in accordance with certain restrictions that are determined by the Department of Streets and Traffic of the City of Detroit. In many areas of the roadway, no maintenance work may be performed during certain designated hours of the day.

The Wayne County Road Commission Maintenance Division is divided into five maintenance districts and the expressway system within the City of Detroit comprises part of one district. Routine maintenance of the approximately twenty-five miles of expressway system is performed by personnel consisting of one highway district supervisor and 20 men, including foremen, equipment operators and laborers. The expressways are given top priority and all specialized operations, such as lane marking, signs, mowing, bridge and pump-house maintenance, and all emergency work, are a cooperative effort of several departments and maintenance districts.

Sweeping and Cleaning. Sweeping is accomplished during daylight hours and the machine and operator are protected at the rear by a truck which tows an eight-panel, alternating flasher. Because of work restrictions, this operation is not carried out according to any so-called schedule or route. Areas in unrestricted zones are swept as it

becomes necessary. Due to the large amount of dirt and aggregate hauling it is not uncommon to sweep the same area several times a week while other areas remain unswept for periods of ten days or more. The paved median strip which has a center protective guard-rail is swept in the spring and fall with a small power broom.

Surface Repair. While the surface of the freeway pavements have remained reasonably smooth, some of the roadway is ten or more years old and certain pavement joints have not been functioning properly. In the past year, seven pavement "blow-ups" have been repaired. Permanent repairs are made at night or on Sunday morning. With the cooperation of the police, the affected lanes are blocked off and signed. The damaged concrete and joint are removed and a new joint is placed in position. Seven-sack concrete with one percent calcium chloride added replaces the damaged concrete. Immediately after finishing the surface, a 12-ft. by 6-ft. by 1-in. steel plate is placed over the fresh concrete. The plate is secured to the adjacent pavement with 8-in. steel pins and the lane is opened to traffic. The plate is removed after three days.

Drainage. At least once each year, several eductors are placed at drainage structure locations along the gutter line and each structure is

properly cleaned. By utilizing all of our equipment of this type on the expressways during this operation, interruption to the free flow of traffic is kept at a minimum.

Marking and Signing. Each year the freeway lanes are re-marked using two lane marking machines. This work is performed on Sunday morning, with police protection, as soon after dawn as weather permits and continues until the police ask us to stop (usually around 10 a.m.).

Expressway signs are cleaned at least once each year and all overhead signs are cleaned and clear-sealed once each year. A sign truck patrols the expressway each Monday morning throughout the year to repair or replace damaged signs.

Litter Pick-Up. If you should ask a maintenance crew foreman on the expressways what his biggest headache is, he is apt to refer to his losing battle with litter. One or more crews are assigned to pick up litter from roadways and banks of the expressway throughout the year.

Grass Mowing. The slopes of the expressway banks within the City of Detroit are 2:1 and tractor mowing was found to be unsafe. Mowing is performed by the use of four, six-man crews who operate twenty-four, dual-wheeled, whirlwind-type power mowers. Expressways include approximately fifteen acres of mowing area per mile and they are mowed approximately every two weeks during the mowing season.

Pumphouses. All mechanical and electrical devices in pumphouses are checked separately each week and pump operation is checked twice weekly throughout the year to assure continuous functioning of these vital facilities.

Maintenance Patrol. Our maintenance division also operates a twenty-four hour maintenance patrol of the Lodge and Ford Free-

ways. Wrecker trucks, equipped with two-way radio, keep traffic lanes clear of debris and move stalled or wrecked vehicles onto refuge shoulders. Motorists in trouble may communicate and obtain assistance from private garages through the wrecker's radio contact with the dispatcher. Close liaison with the Detroit Police Department is maintained. The patrol reports all adverse conditions to the radio dispatcher.

Our patrol vehicles are 22,000 g.v.w. trucks with 10-ft. wrecker bodies complete with crane boom, winch and tow-bar. Additional equipment carried includes hydraulic jacks, ball peen hammer, crescent wrenches, crow-bar, shovel, fire extinguisher and flares. The vehicles are painted orange and "WAYNE COUNTY ROAD COMMISSION — EXPRESSWAY PATROL" is painted on the cab. A rotating flasher is located on top of the cab. The patrol drivers wear chest and cap badges for identification.

Winter Maintenance. Most urgent of all freeway maintenance is snow and ice control. From November through March, trucks are kept loaded with salt and ready to roll at a moment's notice. As soon as the maintenance patrol reports adverse weather conditions, the radio dispatcher immediately contacts the district maintenance supervisor who arranges for the required personnel to cope with the storm. Trucks, some of which are radio equipped, are housed at two garages, located along the service drives of the expressway. Seventeen dump trucks, each capable of carrying six tons of salt and equipped with a Swenson Spreader, are used in this operation. The trucks are one-man operated and spread salt at a speed of approximately thirty-five miles per

hour. In the past, extensive snow plowing has not been necessary on the freeways; however, all trucks are equipped to carry plows and the plows are available for quick installation.

While the restrictions under which maintenance of freeways is performed might appear annoying at times, we feel that the cooperation we receive from the Detroit Police Department and the Detroit Streets and Traffic Department has paid off in less inconvenience to the travelling public and fewer accidents. For the past ten years no maintenance employees have been injured even though traffic volumes have been well over the capacity for which the expressways were designed. □□□

Table 1—Major Equipment Used in Detroit Expressway Maintenance Operations.

25,000 g.v.w. trucks
Dual control 4 cu. yd. pick-up sweepers
Elgin Eductors
Grade-All
Mobile cranes
Motor patrols
Semi-trailer 3000 gal. flusher
Hydro-seeder
Line-marking unit on 30,000 g.v.w. truck
Athey belt loader
Scoopmobile front-end loader

Note: While this equipment is used in expressway work as needed, it is not assigned to the expressways exclusively.

Table 2 — Expressway Maintenance Costs, Per Centerline Mile, from July 1, 1960 to June 30, 1961.

Item	Amount
Surface Maintenance	\$ 262.00
Sweeping and flushing	1,120.00
Shoulder Maintenance	302.00
Guard-Rail and Guard Posts	282.00
Erosion Control	608.00
Drainage	578.00
Roadside Cleanup	1,168.00
Mowing	2,345.00
Chemical Weed & Brush Control	126.00
Trees & Shrubs	846.00
R.O.W. Fence	228.00
Traffic Signs	475.00
Pavement Marking	232.00
Expressway Patrol	3,410.00
Snow and Ice Control	2,728.00

Note: Bridge Maintenance, including 45 pump-houses, was approximately \$96,000.00 for the year. All figures shown are actual costs without over-head.



● CLEANING safety median. Sweeper is protected by truck with 8-panel flasher.



● COMPLETE treatment is provided by new plant, utilizing roughing and standard rate filters with final settling.

Treating Combined SEWAGE and POULTRY WASTES

GEORGE WHITEN
City Manager,
Gainesville, Georgia

A PLANT, unique in that it was designed principally for treatment of waste from poultry processing plants, has just been completed at Gainesville, Ga. In this part of the country there are comparatively few cities that are required to treat the concentrated type of waste discharged from the various poultry plant operations. The waste is difficult to treat, creating many problems which do not arise in processing normal domestic waste nor most types of industrial waste.

When our first 3-mgd sewage treatment plant, designated as the Linwood plant, was placed into operation in 1956, it handled both domestic and industrial waste. This plant was adequate for only a very short period of time due to the rapid growth and expansion of the poultry industry and an unusual population increase. The Gainesville area has become one of the largest poultry producing centers in the world. We now have seven poultry plants (one-fourth the total of all Georgia) located within the City. These process about 450,000 birds per day under peak operations.

In 1959 the poultry industry was placed under Federal inspection. Immediately the water usage increased from about three and one-half gallons to six and one-half gallons per bird. Since very little of the water used by the poultry processing plants is needed for anything other than washing and cleaning, the quantity of sewage to be treated was doubled practically overnight.

Before designing our Flat Creek plant a considerable amount of planning and research was required to overcome the problems we anticipated from the difficulties encountered in treating poultry waste at our existing plant. Our Engineers, Robert and Company Associates of Atlanta, Georgia; W. H. Slack, Jr., a local citizen advisor; and Gurley Satterfield, Water and Sewer Superintendent, undertook pilot operations at the Linwood plant to establish design criteria for the Flat Creek plant.

The Problem

The city has an ordinance which requires all liquid waste discharged by poultry plants to be pretreated at the plants by passing it through 40-mesh mechanical screens. However, the volume of such waste is so large that some solids reach the sewer and are carried to the sewage

treatment plant even though co-operation from the poultry processors has been generally good. The small percentage of solids which reaches the sewers is actually a large quantity when compared with the concentration of solids in normal sewage. Periodic inspections are made of the screening devices and tests are made of the waste discharged into the sewer system to evaluate the screening operation. Any changes made in the screening devices by the poultry plants must be approved by the Water and Sewer Superintendent.

The poultry industry did not participate in the expense of building the new sewage treatment plant nor do they pay a special sewer charge. The Water and Sewer Department is a combined revenue department with water rates established to include the operation, maintenance and debt retirement of our sewerage system.

The poultry plant waste averages 65 to 70 percent of the total flow in the sewer system. Nearly all the water purchased by the plants is returned to the system. Similarly, they use a considerable quantity of ice which adds to the flow. On a weekday, between 8:00 p.m. and 4:00 a.m. the rate of flow is fairly constant at 2 mgd; at 4:00 a.m. it

levels off to 1.2 mgd, where it remains until 8:00 a.m. It then increases sharply to 2.8 mgd, a rate which is maintained steadily until 8:00 p.m. There is little variation in this cycle; on week-ends the rate drops to about 0.5 mgd.

The BOD of the combined sewage and waste averages about 500 mg/L with peaks over 1,000 mg/L. The solids concentration is also high and the solids removal problem is complicated by large proportions of grit, feathers and fatty materials.

The Flat Creek Sewage Plant cost some \$500,000, with the connecting outfall lines, an additional \$183,000. Both the plant and outfall lines were financed by the issuance of water and sewer revenue bonds and a grant from the Federal Government under Public Law 660, the Water Pollution Control Act. It is estimated that the cost of this plant was some \$140,000 more than one of comparable size designed for the treatment of domestic waste alone.

While the waste and domestic sewage are combined for treatment, the interceptor arrangement is such that most of the poultry plant waste flows by gravity to the new Flat Creek plant. Thus, it is estimated that 85 percent of the flow to the latter is poultry waste. The capacity of the new plant is 1.5 mgd, and an overflow device in the part of the system carrying poultry wastes causes any excess of 1.5 mgd to be diverted to a pumping station, where it is transferred to the Linwood plant. It is planned to expand the Flat Creek plant to 3 mgd within the next four years. The units are laid out so as to facilitate doubling the capacity with minimum expense. The new site provides sufficient space for quadrupling the present capacity.

Plant Description

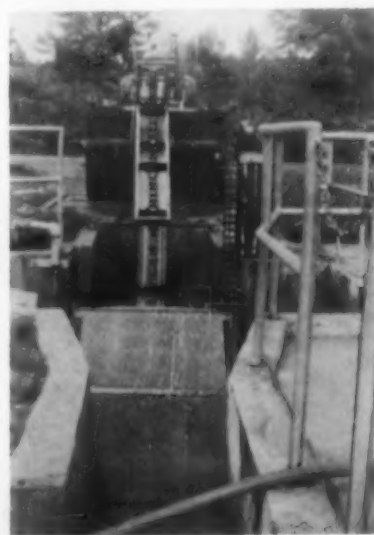
A 24-in. outfall delivers the sewage by gravity to a specially designed mechanical screening device through which all sewage must pass and thence to an elaborate type grit removal unit which contains special collecting equipment eliminating hand cleaning of the grit channel. The fine screen is of the rotating drum type made by Link-Belt, equipped normally with a six-mesh stainless steel cloth. A three-mesh spare cloth is also provided. The screen is kept clean by continuously backwashing with plant effluent. A small pump driven by a 3-hp motor is used for this purpose. The screenings are removed by a chain-and-flight type conveyor which discharges to Dempster-Dumpster 3-cu. yd. detachable containers. It was found necessary to protect the flights with rubber instead of metal wearing shoes. At intervals, the full container is hoisted onto a truck and an empty one left in its place. Final disposal of the screenings is by sanitary landfill.

After passing through the screen, the sewage enters a square grit settling basin equipped with a rotating Eimco-Process collector. Removal is by inclined screw conveyor to Dempster-Dumpster containers, with eventual disposal by sanitary landfill.

The effluent from the grit chamber flows by gravity to a well from which two 1400-gpm Chicago vertical pumps discharge through a 16 in. force main to a 60 foot diameter roughing filter, equipped with a four-arm Carter distributor. The filter bed is 6 ft. deep filled with 3½-in. crushed rock. The purpose of the roughing filter is to reduce the high BOD of the industrial type

sewage and make it more suitable for treatment in the other plant units. It reduces the BOD from about 500 mg/L to less than 250 mg/L. The roughing filter is placed high on the hillside above the plant in order to have a gravity flow through the remainder of the plant units to the final discharge into nearby Flat Creek.

The discharge from the roughing filter is to a primary settling basin, thence to a standard filter. A recirculation pump is provided which can be used either to recirculate part of the flow through the roughing filter, or by a change of valves, can be made to reverse the order of flow so that sewage will first go to the primary settling basin, then to the roughing filter and finally to the standard filter. The remaining units are conventional plant units consist-



● ROTATING drum type fine screen by Link-Belt normally uses 6-mesh cloth.



● SCREENINGS conveyor and grit chamber screw discharge to separate Dempster-Dumpster containers for removal to and final disposal at the sanitary landfill.



● END view of drum screen. A 3-mesh cloth may be used for special conditions.

ing of a secondary settling basin, sludge digester and drying beds.

The primary and secondary clarifiers are each 50 ft. in diameter, with 2 hours' retention at 1.5 mgd. Eimco-Process sludge and scum collectors are used, with scum collection assisted by a water spray from a nozzle mounted on the bridge. The standard rate filter is 150 ft. in diameter, 6-ft. deep and filled with 3½-in. stone. A four-arm Carter distributor is employed.

Sludge Handling

There were two problems associated with sludge handling: transfer of sludge to the digesters and scum formation in the digesters, resulting from the high percentage of fat in the solids. It was decided to employ Wemco "torque-flow" pumps for sludge transfer. The P.F.T.-Pearth gas recirculation system was selected to handle the scum problem. Digestion is by means of a single stage unit, equipped with a P.F.T. 75-ft. diameter floating cover and a P.F.T. sludge heater. Sludge drying is handled by conventional sand beds.

Control Equipment

The effluent flow is measured by a Parshall flume, with remote registry in the control building, involving Hersey-Sparling instrumentation. A brick building houses the Westinghouse electrical control center, a laboratory, sludge pumps, Wallace and Tiernan chlorinator, shower, toilet and locker room.

Results

The operation achieves approximately 75 to 80 percent removal of the influent waste and over 90 percent solids removal. The concentration of suspended solids runs about 450 to 500 mg/L after screening. The screenings and grit removal operations collect 16 to 18 cu. ft. per day. To date, no odor problems have occurred.

Lake Sidney Lanier on the Chattahoochee River receives the effluents of both plants. This lake also is our drinking source, but the intake is upstream from the sewage treatment plant outfalls.

Our poultry waste problem is under control, but this requires constant supervisory action to maintain our present standards. We are constantly seeking improvement. With continued cooperation from the poultry industry we hope to continue to reduce operation expenses, yet provide adequate control and increased efficiency in this operation. □ □ □

COATINGS

for Protecting Water Tanks

C. A. BRUCKMAN
Industrial Paint Company,
Sewickley, Pennsylvania

IT HAS BEEN estimated that the national annual cost of rust is \$7.5 billion. The water service industry would certainly rank high on any list of contributors to this cost. The number of elevated tanks and standpipes in use and being erected represent an increasing investment to municipalities and their taxpayers. Therefore, engineers and water managers are wisely searching for the best coatings to protect these surfaces from corrosion.

Years ago, the interior surfaces of water tanks were painted with a red lead-linseed oil paint. Since linseed oil is not a water resistant vehicle, this type of paint did not provide adequate protection against corrosion for those surfaces which were continually immersed in water; however, linseed oil gave excellent protection to the exterior surfaces. Realizing the need for better protection for the interior of tanks, the AWWA required the addition of two pounds of dry litharge per gallon of red lead-linseed oil paint. This was supplied as a two-component package and mixed just prior to application.

Because of many failures of all types of paints on the inside of water tanks, it seemed desirable to conduct a research program on the effectiveness of various paint systems. In 1931 a number of paint systems were applied to a large water tank at Ambridge, Pa. The test (1) revealed that a phenolic system and a hot applied bitumastic coating were superior to the red lead-linseed oil paints. A similar test was conducted by Mahoning Valley Sanitary District in 1938, except that the interior surfaces were sand blasted in contrast to wire

brushing of the Ambridge tank. In this test (2) the same results were obtained, but surface preparation was shown to be extremely important. To obtain satisfactory service it was imperative to sand blast the surface of an old tank before repainting, or to have the fabricator of new tanks sand blast or pickle with acid to remove rust and scale before application of primer.

Because of war-time experiences with vinyl coatings, another test was started in Ambridge in 1950 to evaluate the relative performance of all paint systems. This test (3) showed that the vinyl systems were superior.

To meet the needs for a high degree of protection at a cost for materials and application that would not exceed the conventional systems when applied at the required coating thickness, three new coating systems were developed by our firm.

The Nocoro epoxy system gives the same protection to the interior surfaces of a water tank as the vinyl, without the care or high cost of application. This system consists of a primer, an intermediate coat, and a finish coat. The interior surfaces of many tanks that have been coated with this system are in excellent condition after years of use.

There are many engineers and water superintendents who prefer to use vinyl systems, but are reluctant because of the high cost. For these, the Nocoro epoxy-vinyl system was formulated. This system consists of an epoxy primer, high solids vinyl intermediate coat, and high solids vinyl finish coat. This system has provided surface protection over a period of years.

Others want an all-vinyl system. They generally specify one formulated to Government specifications: Wash primer MIL-C-15328A; vinyl red lead MIL-P-15929A; vinyl red lead tinted brown MIL-P-15929A;

Nocoro Epoxy Paint System

Primer—Epoxy Zinc Chromate-Red Oxide Primer M-4800

Intermediate Coat—Epoxy Zinc Chromate-Brown Oxide Intermediate Coat M-4801

Finish Coat—Epoxy Aluminum Finish Coat M-4802-I

Nocoro Epoxy-Vinyl Paint System

Primer—Epoxy Zinc Chromate-Red Oxide Primer M-4800

Intermediate Coat—Vinyl Gray Intermediate Coat M-4920

Finish Coat—Vinyl Aluminum Finish Coat M-4902-I

Nocoro All-Vinyl Paint System

Primers—Wash Primer M-4911-X
Vinyl Red Primer M-4900

Intermediate Coat—Vinyl Gray Intermediate Coat M-4920

Finish Coat—Vinyl Aluminum Finish Coat M-4902-I

and an aluminum vinyl finish coat SSPC-Paint 8-55T. Because of the low solid content of these materials, the price of application to produce the generally specified 5-mil coating thickness is very high. To overcome this objection, the Nocoro all-vinyl system was developed. It consists of a single component wash primer, high solids vinyl red primer, a high solids intermediate coat and a high solids finish coat. These vinyl coats provide the specified film thickness with fewer applications, and keep the costs within reason.

In the past, the exterior of water tanks have often been painted aluminum, but now with tanks being erected in congested areas, light pastel shades such as greens or blues, which harmonize with either the landscape or sky, are being used. In the past, because of the slow drying materials used, it had been necessary to brush or roll these surfaces. The new fast drying finish coats are now being used successfully without damage to homes and parked cars when applied with a spray gun. Along the sea coast or in an industrial area where there is a corrosive atmosphere, the vinyl finish coat is recommended. For those who want the ultimate in an exterior finish coat, the acrylic product should be used.

Specifications

It is extremely important to write rigid specifications for the painting of new tanks or repainting of ones already erected. To obtain the best life from a coating, especially on the interior surfaces, besides proper surface preparation, the specifications should require three coats of paint applied to a minimum dry coating thickness of $4\frac{1}{2}$ mils. The modern approach is to require the

primer film to be $1\frac{3}{4}$ to 2 mils; the intermediate coat to have a total film thickness of $3\frac{1}{2}$ to 4 mils, with the finish coat providing a total film thickness of at least 5 mils. It is desirable to inspect each coat to determine that the specifications are met. One of the main factors involved in the durability of the coatings against corrosion is the oxygen

and water permeability of its film which is in direct relation to film thickness. Adequate protection against corrosion will not be provided unless this requirement of film thickness is observed.

An important practice is an annual inspection of the tank. By doing this, any areas in which corrosion is just beginning, due to faulty application or to a thin film, can be repainted to prevent further corrosion. This greatly increases the life of the coating on the interior of a tank. At the end of 5 to 10 years, one finish coat applied over the whole interior surface will protect for another few years, thus eliminating the costly operation of sand blasting. □ □ □

References

- 1—Final Report of Ambridge Test of Paints for Water Tank Interiors, Pittsburgh-Des Moines Steel Company Technical Bulletin No. 3304 (1933).
- 2—Steel Structures Painting Manual Volume 1.
- 3—"Test of Paints for Water Tank Interiors," by John D. Keane and Joseph Bijos. *Journal AWWA*, May, 1960.



Courtesy Peoria Water Works Co.

● INTERIOR and exterior of this tank were coated with Nocoro epoxy vinyl system.

SNOW and ICE CONTROL— A Full-Time Engineering Job



This paper was presented by Robert E. Lee, Snow and Ice Control Engineer at the First Annual Highway Conference sponsored by the Massachusetts Department of Public Works and held this year in Boston, Massachusetts.

THE MASSACHUSETTS Department of Public Works for many years has had representation on Committees for Snow and Ice Control of both the Highway Research Board and the American Association of Highway Officials. Because of this close association with these organizations and with the contacts we have had with other states and with toll road authorities in the snow belt, we have gained considerable background for our program.

The duties assigned to the snow and ice control engineer under the supervision of the maintenance engineer are as follows: 1) Plan and supervise snow removal activities; 2) study, evaluate and make recommendations on methods used in other snow belt states, published reports on chlorides, effectiveness of snow fence, methods of marking drainage structures, and the use of sand boxes; 3) prepare proposals for the purchase of chlorides and abrasives, and for highway cleaning and catch basin cleaning contracts; and 4) in conjunction with the right of way engineer, recommend the acquisition of land for maintenance sites. We believe that Massachusetts is the first state to have an engineer assigned to snow and ice control on a full time basis.

We have at various times experimented with brine solutions of so-

dium chloride, calcium chloride and a combination of these two; also with mixtures of sodium chloride and calcium pellets and sodium chloride and flake calcium chloride.

Our early experiments with chloride mixtures had not been very conclusive but we were convinced that the use of these mixtures did have advantages.

It was decided that during the winter of 1959-1960, we would conduct an experiment on a much larger scale than previously attempted. A maintenance section, comprising approximately 100 miles of highway, was selected in Worcester County. Route 15 and part of Route 20 is included in this section. These routes carry an average of 15,164 cars and trucks a day and have grades up to 7 percent.

It was decided to use one mixture of chlorides throughout the winter regardless of the temperature. This mixture was one part of calcium to two parts of salt by volume. Our salt was delivered in bulk and the calcium was delivered in bags. These materials were stockpiled on each side of a bituminous concrete pad. A gang of men opened the bagged calcium onto the pad and then a front end loader made a pile of the mixture which was continually being turned over as the pile increased in size. About 1000 tons of the mixture were made at the beginning of the season. After the mixing was completed the pile was covered with a sheet of polyethylene to protect it from absorbing moisture from the air.

Except in the case of low temperature and light dry snow, the mixture was applied to the pavement as soon

as possible after the beginning of the storm. This was spread at the rate of about 500 pounds per mile, about 14 feet wide along the center of each roadway of a divided highway.

The action of the mixture was noticed in about 10 minutes after it was applied. Following the first application, patrols covered the section paying special attention to curves, hills, traffic lights and other known critical spots. The first application ordinarily lasted 3 to 4 hours unless the temperature was very low.

After an accumulation of about 2 inches of slush, plowing operations were started. In the event of heavy prolonged storms that caused a temporary pack on the pavement a second application was applied in about four hours.

Based on the results obtained, the use of chloride mixtures was extended to many other areas throughout the state this past winter. Since this is a new approach to snow and ice control, we realize that it will take some time to acquaint all personnel with the use of these mixtures.

The use of chloride mixtures proved to us that the tremendous amount of sand that we had used in previous winters could be reduced. The following tabulation shows the tons of materials used in the experimental section for the past three years:

	1958-59	1959-60	1960-61
Sand	11,898	1,311	165
Salt	1,760	1,890	1,677
Calcium	177	591	415

Firm costs figures are not available for these past three years. However, we do know that in spite of the increase in cost of materials, savings are being made in other areas. These include the use of less equipment to spread the material, the elimination of auxiliary stock piles of sand and extra loading equipment. Also, a lesser amount of sand has to be picked up in the spring.

There are both advantages and disadvantages of using chloride mixtures as determined by the various tests that we conducted. The calcium chloride acts as a triggering agent and greatly speeds up the melting action. With temperatures in the low twenties, immediate melting action can be noted when using chemical mixtures. The addition of calcium to rock salt appears to prevent the re-crystallization of the rock salt and resulted in reduced loss of material due to throw-off and bounce when spreading.

Mixing the two chemicals, however, involves handling and storage. On the New York Thruway these costs were \$1.25 a ton, in Massachusetts it was considerably higher because bagged calcium was used. Sheds or buildings for the storage of the bulk calcium should be constructed. While bulk calcium may be stored on a bituminous concrete pad and covered with a tarpaulin or water repellent cover, it would be easier to handle if stored in a building.

Pavements, when treated with the mixtures, have a tendency to stay wet longer. This may be overcome by spreading a light coat of untreated sand which will act as a blotter. During prolonged storms,

refreezing may occur if a second application of the mixture is not applied at the proper time.

The effectiveness of any plan for snow and ice control depends mainly on two factors: 1) Choice of the correct procedure to be followed, and 2) the close observance of the procedures as outlined.

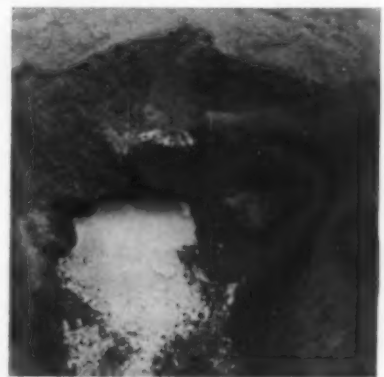
We prefer to use washed sand which is purchased by the ton. The average cost is about \$1.20 per ton. The gradation of washed sand is more uniform than screened sand and gives us less trouble when spreading with automatics. Stones larger than $\frac{1}{4}$ in. can be a hazard if spread on the highway.

Our salt is purchased either in bulk or bag. In most cases the bulk salt is used since there is a saving of about \$6.00 per ton. We try to have our salt delivered during the summer months. To protect it we use laminated paper or polyethylene sheets. The past year a large quantity of canvas tarpaulins have been purchased from the Federal Government. We expect that these will give us better service than the paper or polyethylene. Plans are also being made to construct pole-type buildings to store our bulk chlorides. Our calcium chloride has been purchased only in bags but bulk calcium may be available for this winter's use. It is estimated that the use of bulk calcium, considering the previous cost of handling and opening the bags, will reduce our cost about \$10.00 per ton.

It is estimated that the cost to pick up sand spread during the winter storms ranges between \$6.00 and \$10.00 per ton. The past two years this Department has let out a few contracts for picking up sand from

the highways, mostly along the major routes. Our catch basin cleaning contracts have been very successful. In 1954, we had one contract for cleaning 1100 catch basins at a cost of \$5.35 each. Each year, we have increased the number of contracts and the cost has gone down. In 1960, there were 27 contracts, for cleaning 25,000 catch basins at an average cost of \$3.03 each. We believe that the cleaning of the catch basins is a proper charge against snow removal since most of the material removed is sand.

As new maintenance buildings are established, prime consideration is given to our snow and ice control operations and the necessity for getting the equipment onto the highway at the beginning of the storm. The use of valuable land adjacent to interchanges that might otherwise be occupied by industry or business is justified by the fact that prompt action at the beginning of a storm will keep the highways open. □ □ □



● BULK calcium chloride stored under sand and polyethylene cover for nearly five months still remained free flowing.



● EMPTYING bags of calcium chloride by hand for mixing with salt. Use of bulk calcium chloride would reduce costs.



● FRONT-END loader is used to spread a layer of calcium chloride on a pile of salt to facilitate mixing the chemicals.

KING-SIZE MARINA

is a Federal-County Project

THE LARGEST small craft harbor in California is under construction at Playa del Rey, a suburb of Los Angeles. The harbor, called Marina del Rey, will represent an eventual expenditure of about \$80 million including Federal, County, and private investments. Its development is converting below sea level wasteland into a model playground for southern California boating, fishing, and swimming enthusiasts. Total area is about 800 acres, half of which will be water.

When the basic construction is completed sometime late this year, the Marina will provide berthing accommodations for about 6,000 light craft vessels and storage areas for nearly 2,500 trailer-mounted boats. Lands are being leased within the Marina to establish hotels, motels, repair yards, shopping districts and other supporting features; in addition, some of the water area will be leased. The private investment is expected to top \$50 million.

Work is being concentrated on the removal of about 12½ million cubic yards of materials for the entrance channel, main channel, and eight berthing basins. This work is being done by Pacific Dredging Company of Paramount, California under a \$3,970,886 contract. The basin dredging is being supervised by the Corps of Engineers. Dredge production has been in the neighborhood of 1,500 cubic yards per hour with much of the spoil being pumped behind levees to build up the moles, and some deposited in other areas requiring fill.

Pacific Dredging is affiliated with the Macco Corporation of Paramount who is handling the construction of some 41,000 lineal feet of bulkheads and installation of nearly 50,000 lineal feet of sanitary sewers.

Another important construction phase is the placing of revetment stone along portions of the entrance channel. Connolly-Pacific Company has been awarded the contract for this work which will require over 90,000 tons of rock.

The G. W. Boggus Company of El Monte, California, has the job of leveling the perimeter land around the Marina, as well as some of the levee construction. Nine TS-360 motor scrapers and three HD-21 tractors were used by the contractor



● ACCORDING to the artist, this is what the new marina will look like. Project will berth 6,000 light craft, with storage for nearly 2,500 trailer-mounted boats.



Courtesy Allis-Chalmers Mfg. Co.

● CONSTRUCTION work involved moving about a million cubic yards of dirt; other work included 53,000 ft. of sewers, 41,000 ft. of bulkheads and hotels, motels, etc.

to help move some 25,000 cubic yards of heavy mud and clay per day. About a million cubic yards were moved in nine weeks. Another contractor, Charles J. Rounds Company of Azusa, had the contract for clearing and leveling approximately 170 acres of semi-swamp land littered with debris and stumps.

Because of the mucky conditions that prevail on the Marina project, earthmoving chores have been challenging if not difficult, but contractors have been able to meet and beat deadlines during the course of construction. In addition to the harbor development itself, work is under way in building access roads and installing the necessary utilities. A main perimeter road and connecting roads to the various moles comprise the major access route system for the new Marina.

The cost of Marina del Rey, less improvements and private development, is about \$30 million of which the Federal government is paying some 10 percent plus. The balance of funds, provided by the County, amounts to a little more than \$26 million. Of this, about \$15 million represents borrowed funds, with \$11 million provided from general tax funds for purchase of the land, site clearance and preparation, and for funding one-half the cost of the jetties and one-half the total dredging job.

Certain land and water areas will be leased to private enterprise on the basis of competitive bids for a period of 60 years. From the leases, the County expects to amortize its bonded indebtedness within the first 15 years of operation. Fiscal consultants estimate the revenues derived from this source will be in excess of 2.25 million per year, of which \$500,000 would be required by the County for maintenance and operation of the harbor. In addition to this direct return, it is estimated that the improvements which will be constructed, maintained and operated by the lessees will return better than 1.5 million per year to the County in new general taxes. When Marina del Rey becomes a full-fledged nautical community, it will have a permanent population of about 6,000 persons with a weekend operation of upwards to 25,000 sea enthusiasts.

Project engineer and field superintendent for Pacific Dredging Company is G. W. Rick. Project supervision for the Corps of Engineers is under the direction of Col. William T. Bradley, District Engineer, and Alexander R. Ross, resident engineer. □□□



● 33-YEAR OLD reinforced concrete sewer force main was relocated because of marina construction. Tests showed increase over original strength, no deterioration.

33-Year-Old Force Main Shows Increased Strength

IN CONNECTION with the construction of the Marina del Rey, required relocation of a 33-year old sewage interceptor force main and provided a rare opportunity to re-appraise the pipe. The 7,424-foot line was laid in 1928 on reinforced concrete cradles as part of the City of Los Angeles' Venice Outfall System. Several 8-foot sections of the 36-in. centrifugally spun reinforced concrete pipe were removed from the new marina area in 1961 and two were tested by the Los Angeles Department of Public Works, Bureau of Standards.

Comparison of the 1928 specifications with 1961 test results showed a great increase in strength. The original specifications called for pipe to have a D-load strength of 1,100 pounds by the 3-edge bearing test. In 1961 the two sections withstood D-load tests in excess of 2,800 pounds.

Outside of discoloration on the interior surface, there were no visible signs of deterioration. The shal-

low "brush marks" created during manufacture still showed. Upon testing with a screwdriver at the center of the flowline area, gouging was possible only to a depth of 1/4-inch over a width of 6 to 8 inches. Otherwise, the concrete seemed sound. According to the Bureau of Standards the joints also appeared in generally good condition after 33 years use.

When the force main was laid, specifications called for minimum infiltration, as the line ran below ground water level and even under major creeks. Actual infiltration proved to be roughly one-fifth the specified figure. When in 1954 it became evident that the growth of Los Angeles required additional sewer capacity, tests of 0.133" steel wire in the pipe showed a yield point of 39,000 psi and tensile strength of 52,500 psi, indicating theoretical ability to withstand a hydraulic head of 126 feet. Accordingly, the operating head was increased from the original 80 to 100 feet.

The 36-in. centrifugally spun reinforced concrete pipe was manufactured in 8-foot lengths by American Pipe and Construction Co. of Monterey Park, California. Installation was supervised by W. T. Knowlton, then Metropolitan Sanitary Engineer.

Under supervision of Lyall A. Pardee, City Engineer of Los Angeles, the old line is being replaced at a point closer to the ocean with 48-in. centrifugally spun reinforced concrete pipe using rubber gasketed bell and spigot joints. □□□

EXPANSION TRIPLES Water Plant Capacity

A major portion of this \$3,000,000 addition was built for open-air operation, a feature made possible by the mild climate at Phoenix. This resulted in considerable savings in construction cost and contributed to the accessibility of equipment and ease of maintenance and repairs.

ART F. VONDRICK

Assistant Water & Sewers Director,
Phoenix, Arizona

SINCE 1906, when the City of Phoenix purchased a privately-owned water works, the story of the Phoenix Water System has been an unrelenting task of constant improvement of the water quality served to its customers. As early as 1918, bond funds were used to develop an excellent supply of good tasting water from the Verde River well field, over 30 miles away from the city. Additional wells were drilled beyond the city limits in succeeding years but it was not until World War II that it became apparent that large additions to the water works were necessary to meet the future needs of the city.

The surface flow of the Salt River and the Verde River offered dependable water supply of good quality. These two rivers supply impoundments behind six large dams located 40 to 60 miles from the city. Except for times when torrential rains produce the West's famous "gully-washers" you can walk across the Salt River in the heart of Phoenix without getting your feet wet. However, it was to take much more than engineering technology and construction skill to span the distance and get the water to the consumer.

In contrast to the riparian rights water laws prevalent in the East, the basic water law of Arizona is one of prior appropriation and beneficial use. The right to appropriate water is a right that belongs to the land-owner, but the water appropriated is appropriated for the land.

The operation of the storage dams and the appurtenant canals are the responsibility of the Salt River Val-

ley Water Users' Association. This association delivers water to land and to the users, based on established historical rights of appropriation. This irrigation project was the basis for the excellent agricultural economy that flourished in the valley. Thus the water was not there just for the taking or asking.

When the Salt River Project was first developed in 1903, all the lands in the project, including those within the City, were entitled to water. As the lands served by the Phoenix Water System were sub-divided, the water system required more water. As these lands were no longer cultivated, the irrigation needs became less but deliveries became physically more difficult to meet. This was the situation that confronted the project and the city in the post-war years.

Both of these problems were solved in 1952 by an agreement between the Salt River Valley Water Users' Association and the City of Phoenix, under which the city obtains surface water for domestic purposes by obligating itself to deliver water to the lands. In turn the city must pay to the association the land-owners' yearly water assessment charges. The raw water is delivered to the city's filtration plant. The city in turn delivers the water to the land owner through water mains.

The agreement paved the way for the engineers and subsequent improvements to the water system production facilities, for the most part, have been directed toward increasing the utilization of surface water supplies. Aside from developing a better quality water, surface supplies present an economic advantage, since pumping of ground water is becoming increasingly costly.

The latest such improvement was a 60-mgd addition to the Squaw

Peak Water Filtration Plant completed in 1960. The expansion increased the plant capacity to 90 mgd and made this plant the largest single facility in the water system having a total production capacity of 240 mgd. The design of this plant took advantage of operating and maintenance experiences at the older Verde Water Filtration Plant and the original Squaw Peak Works, both of which employ pre-sedimentation, raw-water pumping, with coagulation, sedimentation and rapid sand filtration. If anything in particular can be said about it, probably accessibility to equipment and ease of maintenance are the features to be noted.

Phoenix's famous climate is somewhat of an asset to the design engineer as well as to the tourist trade and the "aches and pains" group. Winter weather is not a design consideration; however, summer-time temperatures of 110°F. and cloud-bursts are.

Aside from filter operating consoles, the chemical building, and the clear water reservoirs, nothing has a roof on it. Certain critical equipment such as the raw water pumps merit motor construction to meet the high ambient temperatures and the rain problem. But, in general, most standard motorized equipment can be installed outdoors without difficulty. The savings in building structures over pumps, filters, etc. are considerable. As mentioned above the design treating capacity of the additions is 60 mgd, however the maximum hydraulic capacity is in excess of 80 mgd.

Presedimentation Basin

The plant site is on the north bank of the Arizona Canal which delivers most of its quota of irrigation water to the north and northwest parts of the valley. Water de-

liveries are regulated and water must be "ordered" as required by the City. The raw canal water enters the presedimentation basins by gravity where mud, sand, and silt are allowed to settle out prior to pumping. The new basin is about 525 ft. long and 81 ft. wide, with a holding volume of 324,000 cu. ft. The detention time is about 58 minutes at 60 mgd. The basin inlet structure is concrete with manually operated sluice gates for control, but the basins themselves are merely excavated in the natural terrain. The site is at the base of Squaw Peak Mountain in re-ce-

mented talus, and side slopes of 1:1 were maintained without difficulty. The design of these basins considered the fact that during rainy seasons turbidities in the canal could be extremely high and basin effluent turbidities of 2,000 units could be tolerated easily in the treatment process. Generally, turbidity reduction through the basins is a minimum of 50 percent. Actually canal and river turbidities have reached over 20,000 units during plant runs but 5,000 units in the presedimentation basin effluent is a practical limit tolerated in the plant.

The excavation for the presedimentation basin as well as much of that for the other units required blasting. However, this blasting had to be performed so that no damage would result to any facility on the side. Blasting at any one time was limited to 10,000 square feet. In spite of much of the work being undertaken adjacent to a 66-in. pipeline and the existing gunite lined reservoir, no mishaps occurred, other than some shattered windows; and all the excavation was completed successfully.

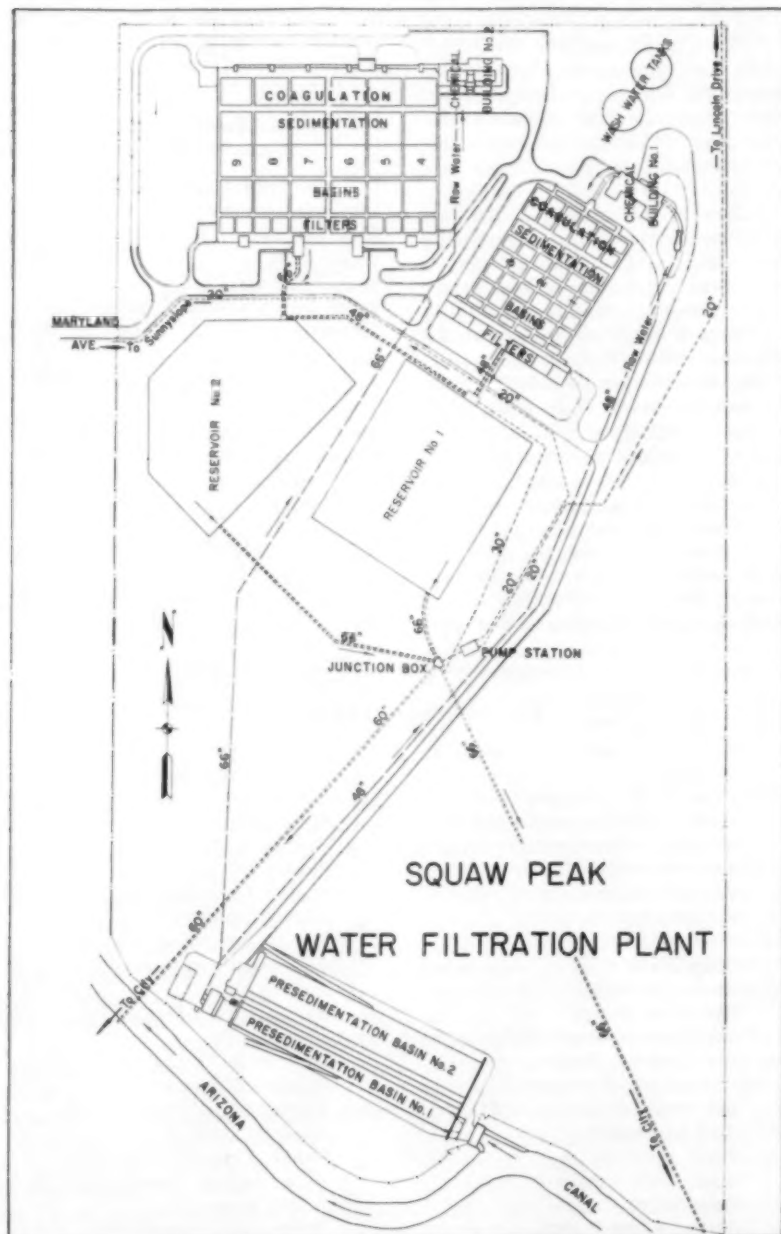
With the addition of 90 mgd in new pump capacity, the total available pumping capacity is 150 mgd. The pumps are vertical, mixed flow, single stage units ranging in capacity from 5 mgd to 20 mgd, each pumping against 70 feet of head. After pumping, during treatment, the water flows through the entire plant by gravity and into the reservoirs. These reservoirs serve the principal part of the city including the downtown area by gravity pressure, the water being delivered through pipelines 66, 60, 54 and 48 inches in diameter. At all elevations too high to be served from the reservoirs by gravity, booster pumping stations are operated to maintain adequate pressures for the consumers.

Chemical Application

Provisions are made for application of alum, lime, carbon and chlorine at various points in the plant. Normally, alum is all that is required for effective coagulation since the raw water generally has sufficient natural alkalinity for floc formation. While under normal operation the alum is fed to the plant influent; it can also be applied to the presedimentation basin or directly to the six flash mixers. Provision for feeding lime is made upstream from each of the two pre-mixers.

The plant addition is equipped with four gravimetric belt-type chemical feeders. Two alum machines each has a maximum capacity of 2,000 lbs per hr. A third chemical feeding machine is a combination lime or alum feeder which serves as a standby. Additional standby capacity is on hand by virtue of an interconnection to the facilities in the original plant. The fourth machine is solely a lime feeder.

The carbon feeding arrangement is a new one for Phoenix, using carbon slurry. One carbon slurry mixer is installed in each of two activated carbon concrete slurry



● LAYOUT of Squaw Peak filtration plant showing Canal and treatment units.

tanks. Each of the mixers is capable of wetting down and producing complete uniformity of a carbon slurry within two hours, after 15,000 lbs. of activated carbon has been introduced into the carbon slurry tank containing 15,000 gallons of water. These mixers likewise maintain a uniform suspension at low speed. The carbon slurry is fed when necessary by two "progressing cavity" type pumps equipped with variable speed drives. Carbon can be applied to the pre-settlement basin, the plant influent channel, or atop the sand filters at a maximum rate of 5,000 lbs. per day. The slurry tanks hold about six days' supply at the maximum rate of feed. In contrast to dry feeding methods used at our other plants, this system is a lot cleaner and more convenient.

Connections were built into the new part so that alum could be fed from both chemical buildings to either the existing or new side of the plant. Likewise the carbon slurry feed from the new plant can be directed to the old plant. In addition, each of the operator's labs in the chemical buildings has a complete set of sampling lines for all operational units.

Most of the coagulant distribution system piping, the carbon slurry pipe, the chlorine solution piping as well as plant sample water piping is of plastic. It is carried through the tunnels and galleries on pipe trays usually suspended overhead on side walls. The pipe trays provide continual support of the plastic piping without the use of individual pipe hangers or supports and permit installation of light wall plastic pipe. The pipe trays and the pipes thereon are easily accessible for inspection, repairs or any other maintenance required.

The chlorination facilities provide for application at the plant influent, filter intakes, the plant effluent channel and the reservoir effluent. Three chlorinators are furnished having a combined capacity of 14,000 lbs. per day, along with two 6,000 lb. per day chlorine evaporators.

The chlorinators are of the vacuum solution feed type with volumetric control. The two large machines each have a capacity range of 600 to 6,000 lbs. per day and the smaller machine 200 to 2,000 lbs. per day. This arrangement provides extreme flexibility as well as standby capacity.

Chlorine storage capacity including units in use on scales allow 20 one-ton cylinders to be retained on

hand. This amounts to 16 days' supply based on an average dosage rate for the month of maximum water production.

The City of Phoenix through its Central Purchasing Office contracts annually for all its chlorine, alum and lime needs as well as many other items. Actually, the stock supply of any chemical is replenished almost on demand, and as a matter of operation, 100 percent utilization of storage capacity is rarely maintained.

Coagulation

After the addition of coagulants, two vertical turbine impeller type mixers uniformly distribute the chemicals throughout the raw water while the water passes through two pre-mixer basins installed in series. These basins are approximately 8 by 8 by 11-ft. SWD and provide a detention time of 15 sec. at design rate of flow.

Following this operation, the raw water is diverted into six parallel flow units. The initial portion of each unit comprises a flash mixer basin. The flash mixers are similar to the pre-mixer units except for size and hydraulic capacity.

The coagulators are installed in six parallel basins 77 ft. wide, 60 ft. long and 10 ft. 9 in. SWD, providing about 50 minutes detention. The coagulators are the paddle type, with shafts installed parallel to the flow. Each basin has six separate shafts. Two drive units are provided for each basin with each drive unit operating three rows of paddle mixers through chain linkage in a dry com-

partment. The dry compartment actually is the main access tunnel to the pipe gallery below the sand filters. Variable speed drives are provided with a 3 to 1 ratio.

The six parallel settling tanks are each 220 ft. long by 77 ft. wide by 10-ft. SWD and are equipped with Straightline collectors. In all there are 24 longitudinal collectors and 6 cross collectors. A surface settling rate of less than 600 gals. per sq. ft. per day and a weir overflow rate of less than 20,000 gals. per lin. ft. per day were used as design bases. These criteria have proven very satisfactory in the past and continue to do so in the new plant. Together with effective tank baffling, this type of design continues to produce a filter influent that very rarely exceeds 5 units of turbidity.

Rapid Sand Filters and Wash Water Tanks

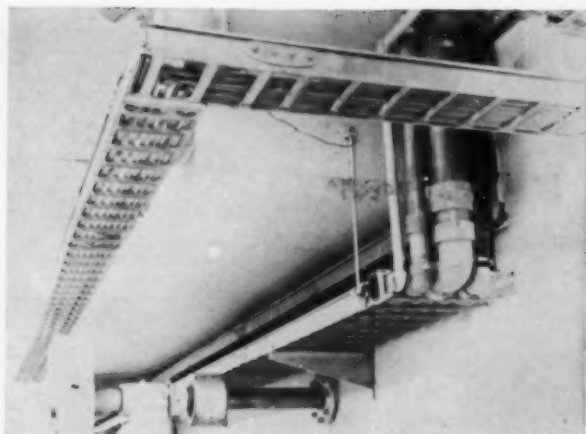
Each of the six parallel flow units incorporates two sand filters. Each filter is 35½ by 38 ft., providing about 1160 sq. ft. of sand area. The sand beds are 24 ins. deep, with 11 ft. of free board. The design rate of filtration is 5 mgd per filter or 3 gpm per sq. ft.

The filters are equipped with self-propelled rotary filter agitators, operated prior to backwashing. Backwash water is supplied from two one-million gallon steel tanks mounted on natural terrain at the proper elevation. A maximum backwash rise rate of 36 ins. per minute is a design factor.

Actually the wash water tanks serve a dual purpose in that their

List of Major Equipment

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Electric and Pneumatic Meters	B-I-F Industries, Inc.
Variable Orifice Meters	Fischer & Porter Co.
Filter Flow Controls	Infilco Inc.
Carbon Mixers	Mixing Equipment Co., Inc.
Pre-Mixers	Mixing Equipment Co., Inc.
Flash Mixers	Mixing Equipment Co., Inc.
Coagulators	Equipment Engineering Co.
Sludge Collectors	Link-Belt Co.
Raw Water Pumps	Byron Jackson Pumps, Inc.
Dry Chemical Handling Equipment	Link-Belt Co.
Dry Chemical Feeders	Wallace & Tiernan, Inc.
Chlorination Equipment	Wallace & Tiernan, Inc.
Electrical Sub-Stations and Control Centers	Westinghouse Electric Corp.
Air Compressors	Gardner-Denver Co.
Filter Agitators	Palmer Filter Equipment Co.
Wash Water Pumps	Byron Jackson Pumps, Inc.
Plant Water Pumps	Aurora Pump Div.
Carbon Slurry Pumps	Robbins and Meyers Inc.



● PLASTIC pipe was used extensively for coagulant distribution, carbon slurry, chlorine solution and sampling pipes.



● FILTER operating room showing bank of indicating and recording gages and three filter operating consoles at right.

elevation provides water pressure to a part of the "second pressure zone" of the water system.

Filter Controllers

The Squaw Peak plant filters are equipped with effluent rate controllers and a master control system which work in conjunction with each other. Each filter effluent controller consists of a venturi tube with a hydraulically operated control valve actuated by a pneumatically controlled pilot valve and a pneumatic transmitter.

The control valve is rubber lined and of the butterfly type. The controller actuating mechanism is of the pneumatic-hydraulic type in which an air pressure proportional to the flow is balanced against a pneumatic loading pressure. The pneumatic loading pressure is adjusted either by a manual rate setter on the filter control table or through the master control system.

One filter console is installed in each of the four filter buildings, each console having controls for three filters. These provide means for switching rate-of-flow control from operation by the master control system to individual filter operation or vice versa. In addition, the rate of flow through each filter can be set or varied manually. A hydraulically operated pilot valve is furnished for each filter for independent operation of the control valve in the event of failure of the pneumatic system.

The master control system is pneumatic and serves to maintain equal rates of flow from each of the filter effluent controllers which are in service at the time.

The wash water control system is similar to the filter effluent control system, using a venturi tube with a

hydraulically operated butterfly control valve and a rate of flow converter. An automatic programmer is included in the backwash procedure to control the rate of increase of rise and to control the maximum rise. This equipment insures a uniform and optimum procedure of filter washing.

An important innovation that benefits our operation is the arrangement of the electrical facilities. The power comes into the main panel first, then is sent to various local panels throughout the plant. The various local panels have disconnect switches for all local area equipment which permits shut down for maintenance without having to go to the main panel.

Sequence of Work

In order that the existing plant and reservoir would not be put out of service during certain critical months, certain portions of the contractor's work had to be performed at specified times.

There is a period of time, usually in January and/or February when the Arizona Canal is drained for canal repair and improvements. During this period the existing Squaw Peak plant would be out of service. The contractor was required to coordinate certain portions of this work with the shut down period and complete these within the shut down time.

The work that was completed during the off-peak season and the shut down period consisted principally of items tying in the new with the old and for converting the electrical system to a primary metering set-up.

The new raw water presedimentation basin together with the influent and effluent walls, the pump-

ing station concrete structure and the retaining walls and forebay section had to be constructed prior to any work in the existing basin. Work on the existing basin had to be done during the canal shut down period as well as the installation of connecting lines.

Likewise, the contractor had to construct the reinforced concrete bar rack structure ahead of the existing raw water pre-sedimentation basin near the canal during the shut down period and also construct the influent and effluent walls in the existing basin with 60-in. pipe connections to the new pumping structure during this time.

All the sluice gates, gate operators, bar racks, structural steel and other materials had to be on hand prior to the commencement of the work.

The contract cost of the new additions amounted to \$3,137,700 exclusive of a new 20-mg reservoir and a new one million gallon wash water tank. Fisher Contracting Co. was the contractor and the plant was put into service on time in spite of a 55-day strike and delays in equipment deliveries. Plans, specifications and inspection of construction were carried out by John A. Carollo, Consulting Engineers.

The main visitor's attraction at the new additions is a feature that emphasizes that "seeing is believing." Tours through the plant are concluded at a viewing window located over the clear water tunnel leading to the reservoirs. By means of under water lights, visitors glimpse the "Phoenix Bird" through a 16-ft. depth of water. The "Bird" is a colored mosaic built into the floor of the tunnel and probably is one of the best public relations tools we have. □ □ □

6 Years of Refuse Composting in Britain

J. GRINDROD
New Milton, Hants., England

SINCE the City of Edinburgh first began converting its domestic refuse into compost in 1955 by means of an experimental Dano Bio-Stabilizer, interest in this process has been aroused in many parts of the world. Although some towns may be geographically fortunate in having a sufficiency of tipping [dumping] space for refuse in its crude state, most cities must reduce their demands on limited tipping facilities by treating their refuse either by separation and incineration or by composting.

It has to be borne in mind, however, that the amount of refuse that has to be disposed of keeps increasing; that, whatever the means of disposal practiced, much of the wastes must go back onto or into the land; and that the capacity of the land to receive this refuse is limited.

When, in 1953, the City of Edinburgh was considering the construction of a fourth refuse disposal plant, against the advantages of separation and incineration were the disadvantages of high capital and maintenance costs and the possibility of atmospheric pollution. There was also a long-standing arrangement to supply manure to farms, nurserymen and householders in the vicinity. Moreover, steps would have to be taken soon to deal with the city's sewage sludge. Finally there was the strong personal conviction of the City Engi-

neer and Manager, Norman Wilson, that incineration was destroying wastes which should be returned to maintain and increase the fertility of the soil.

Although experiments in composting by Sir Albert Howard's Indore process were carried out before and after the Second World War, no real progress was made in this direction until the Dano Engineering Company, of Copenhagen, Denmark, introduced their system. In 1955, the first Edinburgh composting plant was placed in experimental operation at Seafield.

This Dano plant consisted of a receiving hopper, a rotating drum and a screening arrangement to separate the compost from uncompostable materials. The system consisted of rotating the drum or cylinder, known as the stabilizer, into which the refuse was charged. Moisture was added and air supplied. The refuse was retained for a period of approximately five days, the drum rotating meanwhile to mix thoroughly and break up the material, exposing the maximum surface area to bacterial attack. On discharge at the end of five days, contraries and unwanted materials were separated from the compost by screening. The process was a continuous one, refuse being fed in one end and the composted material extracted at the other.

Since no sewage sludge was available for moistening the mass in the drum a 2 percent ammoniacal liquor from the local gas works was added instead.

It was found from the use of this plant that crude refuse was un-

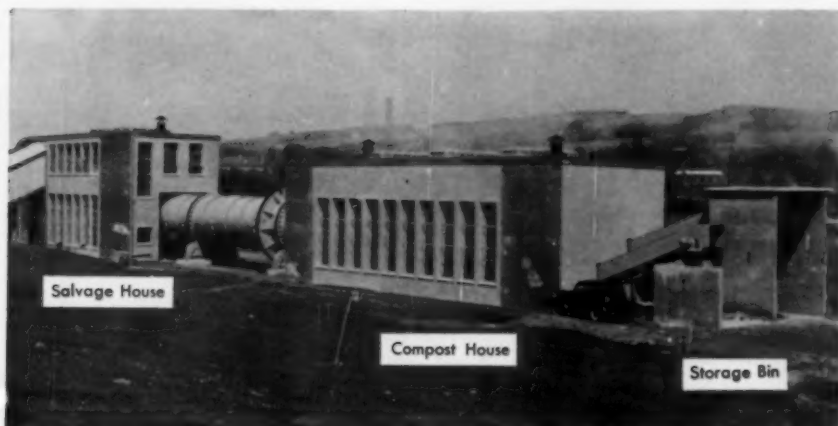
suitable for composting because of the high cinder and dust content, especially of winter refuse, but that an acceptable compost could be produced from the organic "tailings." It was also found that the maximum amount of liquid that could be added was 80 gallons per ton of tailings treated, that compost and rejects were not easy material to screen and that, from the marketing point of view, there was a ready demand for the compost.

From these findings it was concluded that Edinburgh's refuse disposal problem could best be met in the future by retaining the normal process of reception, screening and salvage extraction up to the incineration stage, but, at this point, substituting composting stabilizers for furnaces.

Subsequently, a contract was placed with the Dano Company for the construction of a refuse separating and composting plant with a capacity of 140 tons of crude refuse per day. A site was obtained at Craigmillar, in an area predominantly of playing fields and residential development where it is doubtful whether planning consent would have been granted had there been any question of incinerators or chimneys. At the same time, it was arranged for a stabilizer to be installed at the council's old Powderhall incinerator plant where the furnaces have been out of commission for several years.

The Craigmillar plant includes refuse receiving hoppers, each of 40 tons capacity; screening and salvage extraction arrangements; and two Dano Bio-Stabilizer units,





● PANORAMIC view of the Dalmoak composting plant which is designed to handle 25 to 27 tons per day of refuse plus sewage detritus and serve 25,000 population.

each of 310 cubic yards capacity. This plant deals with all of the domestic refuse from the south side of the City, serving a population of about 150,000. Steel plate conveyors situated in the receiving hoppers deliver the refuse to conveyor belts which carry it to vibrating screens where ashes, dust, stones and glass are extracted and removed to tip. The refuse elements which fail to pass through the perforations are carried forward to rubber belt conveyors where tins and ferrous metals are magnetically extracted and other salvage picked off by hand. The remaining refuse drops off the end of the picking belts into Dano Bio-Stabilizers which are horizontally rotating cylinders, each 80 feet long and 11 ft. 6 in. diameter. Sewage sludge or other suitable liquid is injected at the rate of 70 gallons per ton of refuse, while, along the length of each cylinder, air is blown through nozzles into the mass of refuse. Regulation of the entry of the air and liquid permits aerobic conditions to be created in the refuse. Optimum fermenting temperature is between 120 and 130° F. In approximately five days the fermented refuse is discharged to a rotary screen where contraries are removed. The compost is passed over a glass extraction device and then conveyed to a storage bay, either for immediate sale or for retention during a further maturing period.

The district served by the Craigmillar plant does not make a continuous demand on the plant up to its rated capacity of 140 tons per day. In the year ended May, 1960, it had put through 28,422 tons equal to an average of 545 tons per week. During the thirteen consecutive weeks from 9th January to 2nd

April, however, when one of the incinerator plants was closed down, the Craigmillar plant dealt with 10,193 tons, averaging 784 tons per 5½ day week, with the highest week's throughput being 845 tons.

Compared with the operating costs at the Edinburgh City Council's Seafield separation and incineration plant, which is roughly of comparable size, those at Craigmillar work out at 4s./2d. per ton of crude refuse cheaper over a year's operation. Including capital costs, a total saving of about 9s./a ton is estimated over a comparable incineration system. Other less tangible assets, of course, include soil betterment, absence of atmospheric pollution, a remarkably clean environment and a process which will, in due course, go a long way toward helping the city to tackle its sewage problems.

For every 100 tons treated at the Craigmillar composting plant, 57.8 tons of dust and cinders, stones and glass, tins and other salvage were extracted, compared with 53 tons in the Seafield separation and incineration plant. While 42.14 tons of "tailing" were charged to the composting stabilizers, 47 tons were charged to the furnaces; 21.8 tons of uncompostable rejects from the stabilizers compares with 21.1 tons of clinker from the fires, but 24.7 tons of compost were left as a saleable asset. Out of every 100 tons of crude refuse, approximately 25 tons of compost was obtained.

Recent samples of compost, when analyzed, showed a nitrogen content of 0.50 to 0.63 percent; phosphoric acid 0.31 to 0.55 percent; potash 0.19 to 0.25 percent; and moisture 48.0 to 55.8 percent.

At Edinburgh the maximum temperature reached in the stabilizer is

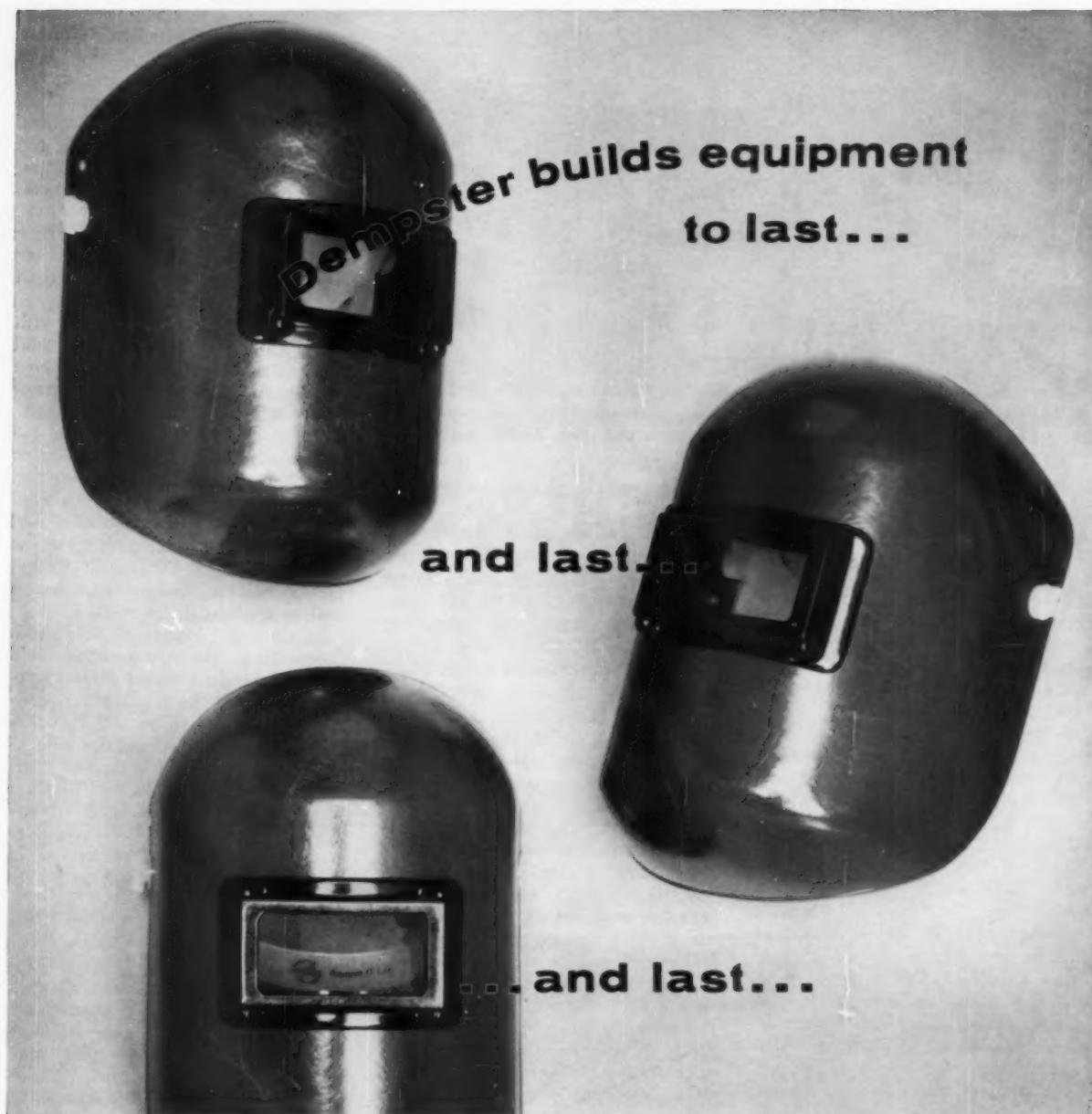
130°F. Since a few hours at 120°F is regarded as sufficient to eliminate pathogenic bacteria, it would seem that the Dano process provides a margin of safety in this respect. A further feature of composting, however, is the activities of the saprophytic bacteria in reinforcing the destruction of pathogens by heat. In tests undertaken by Dr. L. F. Howitt, Assistant Medical Officer of Health, Edinburgh, no enteric or dysenteric organisms were found in the compost.

Earlier troubles associated with the presence of broken glass and similar materials in the compost have been eliminated. The compost contains the major plant nutrients, nitrogen, potash and phosphate, together with trace elements such as iron, boron, manganese and copper. It is rather similar in texture to leaf mould, is clean to handle and free from smell. According to an analysis by the Edinburgh School of Agriculture, the compost has a carbon/nitrogen ratio of 22:1.

In the early stages of Edinburgh composting, the Corporation sold the end product direct to consumers; but, with the placing in operation of the Craigmillar and Powderhall plants and the increase in output potential to 10,000 tons of compost a year, it was decided to place marketing in the hands of a contractor. A three-year basis was later extended for a further period of seven years at a selling price, ex works, of £1 per ton.

Following the lead given by Edinburgh, similar moves have been made by a number of other Scottish authorities. The County Council of Dunbarton has been operating a plant at Dalmoak, near Renton, Dunbartonshire, for the past year, while Kilmarnock, Mid Calder, Aberdeen and other authorities have been considering the technique. In England, the Leicester City Council has also been studying the possibility of operating a Dano composting plant, using sludge from a new sewage disposal works.

The new composting plant of the Dunbarton County Council is sited near the Dalmoak pumping station and disposes of domestic refuse from the Vale of Leven area of the county with sewage sludge detritus from the pumping station which serves the same area. It is designed to handle 25 to 27 tons of crude refuse per day and of absorbing 5 tons of sewage detritus per day having a moisture content of 92.4 percent. It will serve a population of 25,000 people. The estimated cost of this plant is £74,400 (\$208,000). □□□



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NATIONAL PUBLIC WORKS WEEK A-OK

Reported by
DON FAIRLIE

Director of Public Relations,
American Public Works Association

The recently-held second annual National Public Works Week observance was, in the balance, a great stride toward gaining national recognition for this event and in bringing before the public its message on behalf of the public works official, his problems, plans and need for citizen interest and support.

NPWW is still in its infancy, but the consensus of opinion is that the "infant" had a resounding second birthday, thanks mainly to the physicians in constant attendance.

Kiwanis International, continuing co-sponsor of the observance, again this year demonstrated sustained enthusiasm and support. From Camden, Arkansas to Los Angeles, California, from Washington, D.C. to Olympia, Washington, individual Kiwanis clubs untiringly accommodated APWA requests, sought local publicity for NPWW and in numerous other ways showed definitely that they share the APWA conviction that recognition and encouragement of public works officials is a most worthwhile endeavor.

Individual members of APWA, chairmen and members of specially named publicity committees, the APWA public relations committee and chapter officers have taken "drawing board" plans for the ob-

servance and put them to work in their communities.

Official sanction and notice for National Public Works Week came in the form of proclamations or statements of support from the governors of Alabama, Arizona, California, Colorado, Connecticut, Delaware, Georgia, Hawaii, Illinois, Iowa, Kansas, Kentucky, Maryland, Minnesota, Missouri, Nebraska, New Jersey, New Mexico, New York, North Dakota, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin, Wyoming, and the District of Columbia. Mayors of cities from Tallahassee to New York to Seattle to Beverly Hills have issued similar proclamations observing NPWW.

In many instances, APWA and Kiwanis representatives were able to arrange for signing ceremony photographs which have been used for state and national publicity purposes. The City of Cincinnati and many other communities supplemented press coverage with "open houses" and tours of public works facilities.

All these measures were taken to accomplish NPWW's three-fold purpose of increasing citizen awareness of the function and importance of public works, gaining recognition for outstanding public works officials and encouraging talented youngsters to consider a career in this field.

The attainment of these purposes is a worthwhile and overdue effort. Without the support of Kiwanis International and APWA members, state and city governments and the news media (including PUBLIC WORKS), the National Public Works Week program would still be a "good idea" rather than an already going concern.

The main objective now must be to keep NPWW not only going but growing as well. It is not yet out of the woods that envelop the early stages of any such program. It must fight for survival and recognition among the other really worthwhile weeks or months that are set aside for other than purely commercial purposes. Neither Rome nor "Smokey the Bear" was built in a day, a year or even two years.

To gain the recognition public works officials deserve, the continued support of persons who believe in the merit of this observance is essential. Public works officials who maintain good public and press

A Correction . . .

APWA's newest Board Member and Director of Region 6 is Hugo G. Erickson, City Coordinator of Minneapolis, Minnesota, and not David L. Erickson of Lincoln, Nebraska, as reported in the November "APWA News Bulletins." Your editor regrets the error involving these two prominent members of the Erickson clan.

OFFICERS: Albert G. Wyler, New Orleans, La., *President*; Edward Booth, Bismarck, N.D., *Vice President*. REGIONAL DIRECTORS: (term ending 1962) Paul R. Screvane, New York, N. Y.; Manon P. Phillips, Augusta, Ga.; Hugo G. Erickson, Minneapolis, Minn.; (term ending 1963) George J. Maher, Lewiston, Maine; Robert S. Hopson, Richmond, Va.; Harlan H. Hester, Fort Worth, Texas; (term ending 1964) Lloyd D. Knapp, Milwaukee, Wisc.; John A. Lambie, Los Angeles County, Calif.; Roy W. Morse, Seattle, Wash. *Immediate Past President*, Frederick W. Crane, Buffalo, N. Y. Robert D. Bugher, *Executive Director*.

relations at all times should have no difficulty in getting cooperation for their NPWW program.

With the continuing and very effective support that has been given during the past two years, the Public Works Week observance will be an invaluable means of developing sustained citizen interest in public works personnel, problems and future planning.

Mississippi Makes It 36

The newly-formed Mississippi chapter of the American Public Works Association, brings to 36 the number of APWA chapters now actively engaged in the discussion of mutual problems facing public works officials, planning of regional conferences to learn of the latest in improved public works practices and techniques, and promotion of citizen interest in this field of valuable service to the American public.

The nucleus of the Mississippi chapter was formed at an October meeting of public works officials held in Jackson. The 25 charter members of the chapter named John Teunisson, city engineer and director of public works, Greenville, Mississippi, as their first president. Other officers are vice-president, Ed



● W. J. Caraway, executive vice president of the Mississippi Municipal Assn., addresses public works officials at the first meeting of the new Mississippi chapter. Others at the speaker's table are APWA Director Manon Phillips, city engineer and director of public works, Augusta, Ga.; APWA Executive Director Bob Bugher; and Chapter President John Teunisson, director of public works, Greenville.

M. Stiles, city engineer and director of public works, Natchez; and secretary-treasurer, Frank Jones, city engineer, Greenwood.

Snow and Ice Control Discussions

A well-attended Fall meeting of the New York-New Jersey Metropolitan Chapter held at Bear Mountain Inn, Bear Mountain State Park, New York, featured a technical ses-

sion devoted to all phases of snow and ice control. Panelists were Henry Liebman, director of operations of New York City's Department of Sanitation; August E. Zentgraf, chief engineer, Department of Public Works, Newark, N. J.; Julius J. Dworschak, village engineer, Pelham Manor, N. Y.; and Gary Byrd, associate editor of PUBLIC WORKS. Topics covered winter maintenance preparations and opera-

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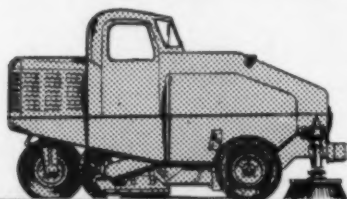
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tions ranging from New York City's mammoth program to that of the small community. Mr. Dworschak startled his audience when he revealed that in his community, municipal forces have accepted the responsibility for clearing all village sidewalks in addition to plowing the streets.

Representatives of Thermal Research and Engineering Corp. and Peabody Engineering Corp. described the development of snow melting equipment and showed motion pictures made during demonstrations of these new machines.

Twin Cities Meeting Reviewed

Delegate response to the recently held 67th Annual Public Works Congress and Equipment Show continues to indicate that the Minneapolis meeting was one of the favorably received, informative and educational get-togethers ever sponsored by the American Public Works Association.

SRO crowds attended the National Public Works Week Kick-Off luncheon to hear an address by Rex M. Whitton, Federal Highway Administrator, the annual banquet, addressed by James E. Webb, Administrator of the National Aeronautics and Space Administration, and general sessions to hear the remarks of Minnesota Congressman John Blatnik and Ivan Nestingen, Under Secretary of the Department of Health, Education and Welfare.

Technical sessions of the Congress, which discussed subjects ranging from traffic control by radar, radio and TV to utilization of waste heat incinerators, conducted by experts in their fields, were well attended. The 126 exhibitors, a sell-out of space available at the Minneapolis Auditorium, packed both display levels with the latest in public works equipment and supplies.

Sidelights and, for the ladies, highlights of the meeting included a special ice revue, fashion show, luncheons, tours and a grand-prize mink stole.

The 68th annual Congress and Equipment Show has been scheduled for September 30 to October 3, 1962, in New Orleans.

Business Meeting Notes

By an 8 to 2 margin, APWA members have approved a \$5 annual increase in the Association's individual active membership fee. The \$15 per year fee becomes effective January 1, 1962. There is no change

in the sustaining, associate, affiliate or public agency fees.

Announcement of the approved dues increase, designed to pay for an increased headquarters staff to handle efficiently requests and services for APWA's fast-growing membership and meet the increased costs of goods and services, came at the annual business meeting in Minneapolis.

APWA membership now stands at 5,560; an increase of more than 500 members for the second consecutive year.

In other actions taken at the business meeting, the APWA board of directors approved a change in the title of the Association's monthly newsletter. Effective January 1, 1962, the publication will be known as the "APWA Reporter." The board also voted to award a President's Plaque" each year to the individual chapter making the greatest progress during the year, gave the President authority to name a committee on ethics, and voiced their thanks to APWA's Committee on refuse disposal, whose five year effort resulted in APWA's latest and fast-selling publication entitled "Municipal Refuse Disposal."

CHAPTER NEWS

The Southern California Chapter of the American Public Works Association will host the Western Area Conference and Equipment Show scheduled for May 30 through June 1, 1962 in Long Beach, California.

The City of Winston-Salem, North Carolina has honored Public Works Director and APWA member Robert W. Neilson, by naming the city's newly-constructed water treatment plant for Neilson, who has served the community for 47 years.

Ben West, Mayor of Nashville, Tennessee, devoted an entire program of his televised "Mayor's Report" to the 690 men and women of Nashville's public works department. Broadcast during National Public Works Week, prints of the program have been made available to the city's educational system in an effort to familiarize youngsters with the valuable services performed by public works officials.

Some 60 members of the Iowa Chapter of APWA attended a recently-held, two day meeting in Newton, Iowa. Discussions at the meeting ranged from technical sessions to an examination of civil defense capabilities and effectiveness.



NOW, the **H-5** Becomes a Wagon Crane

The Bucyrus-Erie H-5 HYDROCRANE® crane-excavator now comes wagon-mounted for complete one-man, one-station operation.

With its exclusively designed carrier, all propelling functions, as well as all crane operations, are controlled from the operator's cab. One man does the whole job. No danger of mixed signals between driver and operator. Ideal for move-up work such as laying conduit or pipe . . . a natural for all pick-and-carry jobs.

A low-ratio planetary axle allows crane to carry full-rated loads on grades. Lockout devices on the steering axle, plus built-in hydraulic outriggers, provide solid stability for side lifts.

The H-5 wagon crane travels up to 15 mph and turns in a 22-ft radius. Wagon power and transmission components are standard Ford truck package — serviceable anywhere.

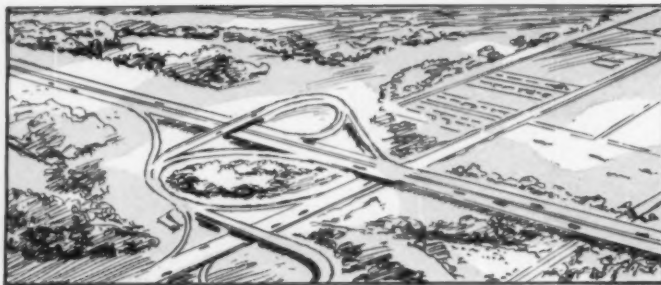
Let your Bucyrus-Erie distributor show you how this fully hydraulic crane with one-man control can handle your most delicate installation jobs overhead or underground. Bucyrus-Erie Company, South Milwaukee, Wis.

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**WORLD'S LARGEST
MANUFACTURER OF CRANES AND EXCAVATORS**

THE HIGHWAY AND AIRPORT DIGEST



Prepared by L. G. BYRD, Associate Editor

Electronic Highway

The technical problems of the automatic highway are influenced by the status of the electronic art and by social, psychological, physiological and economic conditions. Highway automation ultimately must provide maximum driver freedom within the limits dictated by safety and high traffic density. This will require an electronic system partially in the vehicle and partially in the roadway. It must allow for equipped vehicles to operate compatibly with unequipped vehicles and must be relatively inexpensive. The program under way at The Ohio State University may eventually lead to an automatic system. Two major features of the automatic car are automatic steering and velocity control. Velocity control can be one of two general systems: first, where the driver chooses his own velocity; or second, where a constant velocity is maintained for all vehicles. The first is under study at Ohio State. This system creates two electronic circuits which extend outward from the front and rear of the vehicle like imaginary bumpers. When the electronic "bumpers" of adjacent vehicles touch, the rear vehicle will be signalled to decelerate. Automatic steering involves the development of a technique for scanning the highway well in advance of the automobile and Ohio State researchers believe that automatic steering will not be advisable, for safety reasons, for some time to come. Despite highly reliable electronics, systems will be limited by the impulse response of drivers and a Human Factors Research Group is studying this problem in an attempt to quantify the various functions of the driving task.

"Electronic Highway Potential."
By H. A. Boltz, Dean of Engineering, the Ohio State University. A paper

presented at the Regional Conference on Improved Highway Engineering Productivity in Boston, Massachusetts, August 24-25, 1961.

Nuclear Soil Testing

Routine testing of earthwork on a Colorado state highway project is being done with the nuclear instruments of the d/M-Gauge system. The Colorado highway department was concerned about the adequacy of conventional testing procedures in keeping up with modern high-speed, large-capacity earthwork equipment and with the demands of end-result specifications. A research study of nuclear testing methods found: The procedures practical for field use; the device mechanically and electronically well built; performance well within manufacturer's claims; personnel

acceptance excellent and training requirements modest; and radiation exposure negligible.

"Nuclear Soil Testing Gets OK in Colorado." *Roads and Streets*, October, 1961.

Air Photo Interpretation

New tools are needed to provide county planners with adequate information about all the natural resources in the county that will influence its growth and development. Air photo interpretation provides such a tool to describe the land, soil textures, moisture conditions, location of economic minerals, construction materials, drainage patterns and much other data. The technique is a part of the science of photogrammetry. Initial photo interpretation identifies patterns through the evaluation of: Shape of

Production Record for Base Stabilization

A NEW national record for soil-cement base stabilization production in a single day was set recently when workmen completed 75,826 sq. yds., totaling five miles of



● **SPEED** record for soil-cement base stabilization: Five miles of 25-ft. wide paving were placed in a single work day.

25-foot wide paving, on Irish Road in Genesee County, Michigan. The record effort is a result of close co-operation between the West Michigan Engineering Co., of Hart, the cement supplier, and the Genesee County Road Commission. Three P&H single-pass soil stabilizers were kept in tandem operation and 16 water tank trucks worked in relays during the record run. Shown leveling material on the project is Genesee County Road Commission's LeTourneau-Westinghouse 550 motor grader equipped with flotation tires and Preco automatic blade control. Additional equipment also used included three sheepsfoot rollers, two cement spreaders, two rubber tired rollers and three motor graders. About 2,000 barrels of cement to the mile were mixed into gravel.



New Tractor Shovel brings new economies to small town

Michigan introduces Model 55A, early purchaser reports it does many jobs previously skipped (or handled by \$10/hr. rental units)

Like many small communities, the Village of Pewaukee, Wisconsin, for years handled loading and clean-up chores with a farm-type tractor and various pieces of rental equipment. As may be expected, costs were high. But so too, reasoned the Village Board, would be the initial expense of buying a bigger machine . . . especially to a town of only 2000 people.

Then last spring, Aring Equipment Co, Michigan Distributor in Milwaukee, showed the new Michigan 1 yard Model 55A. Price, with trade-in, under \$10,000. Back-hoe, snow plow, sweeper, a lot of other attachments could be added later.

Everyone was impressed. It was easy to figure how this unit's four-wheel-drive, speed and versatility could cut expenses. Also, how it might handle the many jobs previously not done at all or, at best, done inefficiently.

"Since then," says Gary Boyce, Pewaukee Supt of Public Works, "we've used our Michigan for everything." For instance . . .

Saves \$50 weekly rental at the sanitary landfill. The Village makes a monthly pick-up; between times, villagers dump their own trash and rubbish. Once a week a rented crawler would clean up; between times the dump was messy. Now, the Michigan, with 26 mph mobility, runs out every day or two. Clean-up is done quickly, the old \$10 per hour crawler rental expense is eliminated.



Cleans lakefront. Located on a popular resort lake, Pewaukee has the problem of keeping its beach clean. Lake residents and motor boats cut weeds. Prevailing winds blow them to shore . . . sometimes piling them a foot thick. Previously, each cleanup took 15 man hours . . . "hand hours" since the farm tractor couldn't work in sand. Now, the Michigan wades in hub-deep, shoves weeds onto shore, loads them in truck. In one hour the job's done.

Stockpile-loads sand, salt, blacktop, stone. The power steer, power-shift Model 55A with 1 yd bucket heaps a 5 yd truck in five passes, 2 to 2½ minutes. Pewaukee's old farm-type loader took 5 to 7 minutes for the same job . . . if the material wasn't frozen.



Takes place of truck. When trucks are busy, the Michigan may

carry its own load a block or a mile or more. Street patching is a good example. Here, the 26 mph Model 55A carries a yard of blacktop down the street — stops at potholes — operator or helper hand-shovels and packs in materials as needed.



Tree trimming. Due to inadequate equipment, this once was a chore rarely attempted. Now, the Michigan, used as a fast-moving lift-truck, raises a man up to 8 feet off the ground for trimming with chain saw or 18 foot pruner. Thus street lights have been made more efficient . . . traffic hazards removed.

These are but a few of the jobs where the 66½ hp Model 55A is saving time, trouble, and money for the Village of Pewaukee. Let us show you, first-hand, how it can do the same for you!

Michigan is a registered trademark of

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the land; surface drainage patterns; erosion details; photographic gray-tone values; present use of the land; and peculiar micro-details of different "landforms." One major application of photo interpretation is in preparation of detailed surface drainage maps. Other important uses include soils mapping, mapping and evaluation of present land use, engineering reconnaissance and location of construction materials.

"Air Photo Interpretation for County Development." By Robert A. Dunbar, Consulting Geological Engineer. *Ohio County Engineers News*, October, 1961.

Asbestos In Asphalt

On a busy street in Atlanta, Georgia, a test strip of asphalt pave-

ment containing asbestos filler showed some favorable characteristics. A 16-ft. center strip of asbestos-asphalt was sandwiched between 8-ft. strips of conventional asphalt. All three pavements were of the same aggregate gradation and consisted of one-inch binder course topped by a one-inch overlay. The center strip contained 2.5 percent of short asbestos fiber and 7.4 percent asphalt cement. The asbestos-asphalt mix could be rolled closer to the paver than the regular mix and showed no distress when a ten-ton roller was parked for ten minutes on the still-hot surface. The strip suffered no damage when opened to traffic twenty minutes after initial rolling. Johns-Manville engineers, after four years of research, claim the addition of one to three percent of asbestos fiber will

allow the use of substantially more asphalt in a mix and in turn give the pavement increased flexibility with greater flexural strength; greater resistance to densification and rutting; and increased impermeability.

"Accent on Asbestos." *Asphalt Institute Quarterly*, October, 1961.

Silicone Admixtures

Various silicone admixtures, being studied by Dow Corning Corporation, show promise of improving concrete qualities. A silicone admix of 0.3 percent, based on the weight of the cement, may produce a compressive strength increase of as much as 30 percent. Resistance to freeze-thaw cycling and to deicing chemicals is increased, with the durability of non air-entrained concrete

Another repeat Fox buyer reports—

"Fox saved us \$4,000 in material the first year"



*... says
Cornwall, N.Y.
Highway Supt.,
Russell J. Clark,*

"because Fox auger feed made it possible to use bank-run aggregate.

Also, Fox covers 12 miles of roads in one hour where before it used to take us five hours. We bought our first Fox in 1958 . . . have added two more since."

Controlled spread . . . 8 to 60 feet

If, like Mr. Clark, you demand the best in spreader operation, then we think you'll like Fox too. Positive-feed auger eliminates chain and aprons . . . saves up to 90% on maintenance. Heavy-duty spinner spreads all materials more efficiently . . . in widths from 8 to 60 feet. Inside cab controls make spreading a comfortable, one-man operation. And Fox's new transmission regulates spread at any truck speed . . . makes a ton of salt go 6 times as far.



Manpower savings and speed of applying materials are top Fox advantages, report Cornwall, N.Y., officials, who also like Fox in-cab operating comfort and nearby parts availability.

Consider all costs

That's why, when buying spreaders, we urge you to consider operating costs as well as purchase price. In the long run, you'll be way ahead with a quality-built Fox. For additional information . . . or a demonstration of any of four Fox models . . . just call us *collect* to find out which of Fox's 36 distributors is nearest you. Or clip this ad to your letterhead, and mail to:

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Load 10 yards in less than a minute ...without a pusher



It's easy...with the LeTourneau-Westinghouse 143-hp D Tournapull® and Hancock elevating scraper. Here's how it works: as scraper blade cuts the dirt, an exclusive electrically-driven elevator *pulverizes* the material... carries it *up* and back into the bowl. A pusher is definitely not recommended. The last half yard loads as *fast as the first!*

Spread in 5 to 10 seconds



Another time and money-saving advantage of the D 'Pull*-Hancock is positive load ejection. As section of scraper floor slides back, tailgate moves forward... wipes bowl clean in 5 to 10 seconds! You're assured of a fine, accurate spread, too, because the dirt has been "chopped up". And, with a strike-off blade that moves down at the start of the ejection cycle, you accurately *level* material merely by raising or lowering the bowl.

"D's" other production-boosting features include: High power-to-weight ratio... LW power-transfer differential... electric power-steer... 90° turns... permit-free roadability... and choice of step-gear or torque-converter transmission, speeds to 30 mph.

We will be happy to demonstrate the D 'Pull with elevating scraper on *your* job. See for yourself what it can do for you! Remember, you can also interchange elevating scraper for a conventional 9-yd LW scraper, or 11-ton LW Rear-Dump.

*Trademark DPH-2442-G-1



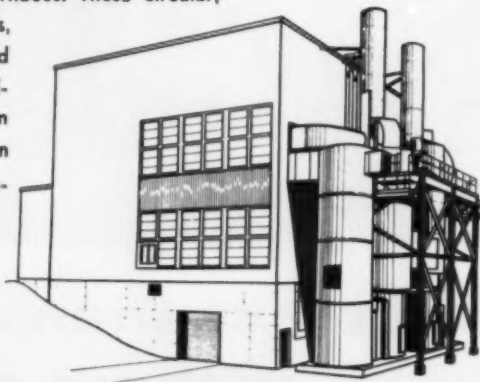
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This highly maneuverable 4T POW-R-DITCHER is only 46" wide . . . fast . . . and can handle most ditching jobs at a fraction of the cost of larger, more expensive units. The finest ditcher buy for low cost investment, low maintenance and high production.

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greatly improved and increases realized in air-entrained concrete. With the silicone admix used, good air-entrainment levels are reached using only about half of the normal amount of air-entraining ingredient. The silicone admix causes a significant extension of set time and a lower temperature of concrete during setting and curing. The causes of these property changes are not yet fully understood and a thorough evaluation of the admix with regard to its chemical mechanism is underway.

"Prospect for More Durable Concrete Through Silicone Admixtures." By B. C. Carlson, Resin Section, Product Engineering, Dow Corning Corporation. Presented at the 47th annual meeting of American Association of State Highway Officials in Denver, Colorado, on October 10, 1961.

Consultants in Interstate Highway Program

In discussing recently the role of the consulting engineer in the Interstate highway program, Rex M. Whitton, Federal Highway Administrator, indicated that the amount of design work handled by consultants would vary with the individual states. Each state is obligated to get the planning done as quickly and efficiently as possible and the use of consultants will depend upon the ability of the states to handle the work themselves. Until 1956 most states handled their own engineering. With the advent of the increased program, consultants absorbed some of the work load to get the program moving.

"The Attitude of the Bureau of Public Roads." Consulting Engineer, October, 1961.

Driver Tension Measured

With the night accident rate approximately double that of daytime and intersections being the most critical points in our road system, much interest and experimentation has centered on the proper design of illumination of highway intersections. The Texas Transportation Institute is conducting a study to determine the effects of various types of intersection illumination and signaling on safety, comfort and operational characteristics. There has been little previous research on driver comfort related to the level of illumination. Tension resulting from complex decisions required at intersections after dark was believed to be a measurable record of

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the effect of illumination on driver reactions. As a measuring tool, the galvanic skin reflex was used. Results of the study indicate that the galvanic skin reflex can be used to produce significant results and to detect the improvement in visibility resulting from illuminating the intersection.

"Driver Tension and Rural Intersection Illumination." By Donald E. Cleveland, Assistant Research Engineer, Texas Transportation Institute and Assistant Professor, Agricultural and Mechanical College of Texas. *Traffic Engineering*, October, 1961.

Other Articles

"Anything New in Snow Control?" While there is little innovation in snow removal practice among public works engineers, this survey reveals awakening interest in new equipment being developed by industry. By W. F. Hallstead, *PUBLIC WORKS*, November, 1961.

"Can We Estimate the Cost of Winter Maintenance?" Reasonable and valuable predictions, based on past experience records, help the Massachusetts Turnpike Authority. By George G. Hyland, Maintenance Engineer, Massachusetts Turnpike Authority, Weston, Massachusetts. *PUBLIC WORKS*, November, 1961.

"A Look Ahead at Highway Programs." A comprehensive view of our national highway program objectives and needs as viewed from the top. By Rex M. Whitton, Federal Highway Administrator, Bureau of Public Roads, United States Department of Commerce, Washington, D. C. *Traffic Quarterly*, October, 1961.

"New Inlet Design for Culverts Saves Highway Dollars for Iowa." Flared inlet culvert blends hydraulic control and construction economy. By Mark F. Looschen, Preliminary Bridge Design Division, Iowa Highway Commission, Ames, Iowa. *PUBLIC WORKS*, November, 1961.

"Rubber in Surfacing Materials." A worldwide look at activity in this field. Roads and Road Construction (London, England), September, 1961.

"Aggressive Safety Program Earns a Record for the Pennsylvania Turnpike." Important factors include improved maintenance, increased enforcement, driver education and analysis of accidents. By Harold S. Roberts, Safety Director, Pennsylvania Turnpike Commission, Harrisburg, Pennsylvania. *PUBLIC WORKS*, November, 1961.

"Future Urban Traffic Patterns." Estimating future traffic patterns in urban areas. By R. Hodgen, Traffic Engineer, Scott & Wilson, Kirkpatrick & Partners. *Traffic Engineering & Control* (London, England), October, 1961.

"Secondary Road Improvement by Stage Construction." Thanks to increased funds, stage construction and stabilization, Virginia's secondary roads show steady improvement. By H. G. Blundon, Jr., Assistant Secondary Roads Engineer, Virginia Department of Highways. *PUBLIC WORKS*, November, 1961.

"Michigan Engineering-Needs Study." Comprehensive study was made by state highway department, in cooperation with Michigan County Road Association and Michigan Municipal League. *Better Roads*, October, 1961.

"Street Sweeping Is a Big Job for Cities." Trend toward full mechanization and problem of parked cars characterize replies to this survey of sweeping programs. By Robert Dymont, *Technical Journalist*. *PUBLIC WORKS*, November, 1961.

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Town History for Manchester

The Town of Manchester, Vt., is preparing a 200-year history, 1761-1961 which will involve about 300 pages of text. About 1,000 copies will probably be printed for sale at \$2 to \$3 per copy.

Placing Flags Along Streets

On national holidays, in Kalamazoo, Mich., the Department of Public Works places flags along the streets in the business area. During 1960, 2,881 flags were placed and taken down at a cost of about 48½ cents per flag.

HEAT MELTS ICE

A carload of Columbia Calcium Chloride gives you over

15 MILLION BTU OF HEAT for faster bare pavements... safer driving

This speedy heat is released when Columbia Calcium Chloride (High-Test Flake) goes into solution in contact with ice or snow. It triggers rock salt at all temperatures in mixes. And it's the premium ice melter for trouble spots.

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MODERN STREET CLEANING

A paper by CARL V. GAILEY, Superintendent Highway Maintenance Division, Department of Public Works, Cincinnati, Ohio, before the New York meeting of the American Public Works Association

THE JOB complement of our Street Cleaning Section averages about 107 men and is composed of one supervisor, five foremen, 14 motor equipment operators, 16 truck driver-crew leaders and 70 laborers.

Our street cleaning equipment includes 15 mechanical sweepers in various sizes from two to four cubic yards; three 2-cubic yard front end loaders; 16 dump trucks, of which two are equipped with two-way radios and two are equipped with self-loading buckets; nine flushers; one 3-wheel motorcycle; five sedans and one pick up truck, all with two-way radios; two hand propelled whitewing power sweepers and 30 whitewing carts.

This organization is divided into four units having separate garage facilities located so as to reduce equipment travel time to a minimum.

This street cleaning organization is adequate under normal conditions, but in times of emergencies such as snow removal, slippery streets, floods and wind storms, it is entirely inadequate. It is during these times and in seasonal operations such as leaf removal, spring clean-up, special clean-up after parades, conventions, etc., that the wisdom of including this function as a unit of the Highway Maintenance Division is apparent, for it is a relatively simple matter to divert the needed labor and equipment to the emergency.

If we are to attempt to meet the public demand for street cleanliness on increasing street mileage and reduced appropriations, we must do so by doing as much cleaning as possible by mechanical methods. Industry has developed efficient, rugged and mobile machines to do this work and is constantly improving on them. However, we in street cleaning are continually in need of more and better machines; machines which, in the hands of competent, well trained operators, can produce more work units at less cost if properly operated and well maintained.

In Cincinnati, all municipal equipment is maintained by a central garage agency which is a Division

of the Public Works Department. This garage is responsible for refilling street sweeper brooms. The regularity of sweeping schedules depends upon the readiness of the sweeping machines and, since these machines are expensive to purchase, they are limited in number. This means a high degree of cooperation and coordination is needed between these two agencies to keep the machines on the job.

Seasonal Operations

We have mechanized leaf removal by mounting leaf rakes on the front of three large street sweepers and pushing the leaves into large piles ahead of the sweeper. The sweeper brooms pick up the small amount of debris that gets past the leaf rake, leaving a relatively clean pavement. The piles of leaves are then loaded by a 3-wheel, 2-cubic yard bucket loader into large trucks which haul them to nearby dump sites.

During the leaf season, three rounds of this operation, over approximately 400 miles of streets, usually completes the job. We remove an average of 14,000 cubic yards of leaves each year. We are proud of our leaf removal method, but this is an operation that is still very much in need of more efficient machines to do this seasonal job. We have made a 16 mm. color film of the leaf removal operation which is available upon request.

Parking

The most serious threat to efficient street cleaning methods is the parking and storing of motor vehicles on the streets both night and day. We are able partly to control this parking to permit nighttime cleaning by installing permanent parking regulatory signs. These signs resemble regular parking signs except the legends are green instead of red and they restrict parking only on certain days of the week on alternate sides of the street. By arranging our sweeping schedules to conform to the signs in these areas, we have been able to achieve a reasonable degree of cleanliness and this method has been well received by the citizens.

More recently, however, with the increased ownership of motor cars, the night and day parking of cars on the streets of many residential areas has seriously hampered our mechanical sweeping operations.

This practice has now reached a point where it is impossible to sweep without the advance posting of temporary "No Parking" signs. We are not satisfied with this method since it is costly and also irritating to the public.

Cincinnati has embarked on an off-street parking program but it has so far been extended only to the downtown business district and has had little or no effect on the street cleaning problem.

We are certain that unless the parking and storing of motor vehicles on the streets is reduced and controlled, necessary changes in street cleaning operations will result in a heavy cost to the taxpayer.

Littering

A good street cleaning organization takes street littering in its stride during its normal cleaning operation; however, when littering becomes excessive, whitewing service is needed to maintain a high standard of street cleanliness. This type of street cleaning is very expensive. Reduction in cost can be realized only through education of the public in good habits and the enforcement of anti-litter ordinances.

We began our anti-litter program four years ago and have now developed it to a point where we feel we are showing good progress. Our anti-litter work, coupled with careful machine routing, has permitted us to reduce the number of whitewings in our organization from 25 to 21.

Thirty supervisors engaged in all phases of work in the Highway Maintenance Division have been trained and given special police authority to help enforce the city ordinances pertaining to street cleanliness as they move about the city in their regular work. We also have two full time "litter inspectors" who work on special problems and area education.

No modern street cleaning organization should operate without a long range plan of education and anti-litter work. When adequately supported by the press, radio, television and civic groups, it cannot help but bring about a revised attitude on the part of citizens. It is a long hard job but the benefits will eventually justify the effort.

This year, for \$300, we purchased 25,000 litter bags printed with our

own slogans and designs. These bags were given away at the city's motor vehicle testing lane, timed to coincide with Clean-Up, Paint-Up and Beautify Week. Gordon Rich, chairman of the city council's highway committee, and "Miss Clean Up" were given good press, radio and television coverage on the initial offering of these litter bags.

Cost Records

The overall efficiency and progress of the organization cannot be appraised unless a simple but complete system of costs of each operation is kept. Our Foreman's Daily Report Form and Operator's Daily Report Form provide the information necessary to determine such costs.

During 1959, 33,784 miles of streets were machine swept at a cost of \$5.27 per mile, using 0.54 man-hour per mile; 713 miles of alleys were machine swept at a cost of \$5.92 per mile. Machine flushing was performed on 8,759 miles of streets at a cost of \$3.69 per mile. Manual street cleaning on 3,931 miles of streets cost \$13.42 per mile, with 4.47 man-hours required per mile; on alleys the cost was \$15.86 per mile. Hand sweeping by "white wings" on 12,242 miles cost \$10.03 per mile. Disposal of 15,294 cu. yds. of hand sweepings cost \$7.92 per cu. yd.; for 8,784 cu. yds. of hand loaded machine sweepings cost was \$3.42 per yd.; and for 7,116 cu. yds. of machine loaded it was \$2.94 per yd. Leaf removal, machine loaded, 11,156 yds. cost \$2.34 per yd. and hand loaded, 2,636 yds., cost \$4.87. It cost \$6.71 per mile for machine sweeping leaves on 2,565 miles of streets.

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Purchasing Used Equipment by Cities

In the September, 1961, issue a report was published on the practice of buying used equipment. Based on 1250 replies to a questionnaire to city engineers and directors of public works, the report stated that 559 cities did buy used equipment and 513 did not. Since that report was prepared, an additional 709 replies have been received. As might be expected, the figures do not change materially; 287 of these cities said they buy used equipment and 299 say they do not. The overall figures from the 1658 replies received from the 1959 returned questionnaires were: 846 cities do buy used equipment and 812 do not. Buying on specification was reported by 115 out of 253 of the 725 who answered this question.

Diesel Engine Starting in Cold Weather

HERBERT ORWIG

Manager of Engineering

Trojan Division

The Yale & Towne Manufacturing Company

DIESEL POWERED units, used in many cases for snow removal equipment, may be difficult to start in cold weather. The combustion principles of diesels are different from gasoline engines and the starting technique is also different.

General good rules to follow are:

1) Keep engine in good operating condition; good valve and ring seating provide maximum compression; clean injector tips assure proper atomizing and even distribution of fuel; 2) keep battery at peak charge; 3) keep fuel clean and fuel lines free of water or air locks; and 4) if shelter is available for your equipment, use it.

The diesel engine has no spark plugs so it relies on high compression to heat air in the cylinder enough to burn the fuel injected into it. Assuming the starter is turning the engine at normal starting speed, there are two ways to get proper starting conditions: 1) Heat the air introduced into the cylinders; 2) use a fuel that burns at a lower temperature than diesel fuel.

In some open chamber diesels, a glow plug is mounted in the intake manifold. When fuel is sprayed onto this glowing element, ignition occurs in the intake manifold and enough heated air is drawn into the cylinder to start the engine in most instances. Some engines mount the glow plug in a precombustion chamber so that a fractional part of compressed air in each cylinder is ignited. Failure in starting with glow plugs may occur because the operator is too impatient to allow the plug to heat fully before he begins cranking.

Ether and ether-base fluids with a lower flash point may be injected into the engine to give almost instantaneous starting. They should not be used carelessly or too freely. In an engine with a glow plug in the intake manifold, ether and the glow plug should never be used at the same time. A backfire or perhaps more serious damage can result.

Ether starting fluids are available in gelatin capsules, pressure capsules and aerosol-type pressure cans. Each form has its particular hardware to direct the ether to the engine intake manifold. Both types of capsules are a one-shot proposition while the aerosol can provides a more generous supply. Warm aerosol cans and capsules vaporize more quickly so keeping the ether indoors until ready for use is advantageous.

Very cold weather causes a crankcase oil to become very viscous and difficult for the oil pump to circulate. It is important to avoid speeding up the engine during this period when lubrication is below normal. There are multiple-viscosity oils on the market which are thinner when cold, and thicken as they warm up. Some diesel engine makers do not approve their use, and it is better to follow the engine maker's recommendation. If it is practical at the end of the working day to drain the oil from the engine, it can be rewarmed in the morning and added with good results.

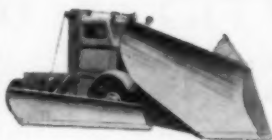
Most automotive-type diesels have an electric cranking motor as a utility starter. Gasoline starting engines give unlimited cranking duration once started. Air starters are excellent and give a higher cranking speed but a regular mobile compressor unit is usually needed.

If a shed is available, it is advantageous to shelter the equipment. Fully enclosed sheds can be heated enough to be of real benefit in starting the engine since the air, crankcase oil and coolant all get the benefit of the warmth. In some cases cylinder head bolts may be replaced with special bolts having built-in electrical heating units. These heaters help by giving warmth to the coolant in the engine water jacket and usually require only house current electricity which may be readily available.

After a diesel engine is started and running smoothly it will warm up to its most efficient operating temperature more quickly if it is run through its ordinary work cycle at a moderate pace. A good rule is to let the engine temperature come up to nearly normal before demanding full engine power.



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A NEW TREND IN INCINERATION

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ELECTRIC RATE MAKING

BRUCE J. ENNIS

Associate,
Burns & McDonnell Engineering Co.,
Kansas City, Missouri

ONE OF THE very important factors in the successful operation and management of an electric utility system is the establishment of suitable and proper electric rates for domestic, commercial, and industrial service. If the rates are too low, service is maintained only at the expense of deferment of necessary or desirable system additions and improvements; the sale of revenue bonds, when required, exacts a penalty in the form of abnormal interest rates; and reserve funds can not be accumulated for depreciation reserve appropriations, adequate working capital, and emergency funds to tide the utility over in the event of a major catastrophe from plant equipment failure or storm damage.

Conversely, if the rates are too high, consumers are prone to limit their usage of the very electric service for which the utility was created and is being operated, and maximum benefit from wholesale utilization of available energy is denied the ultimate consumer.

Because of the vital nature of electric rate making, many utilities maintain on their staff a rate engineer or analyst whose sole responsibility is the periodic review of retail rate schedules to determine their adequacy, appropriateness, suitability and equitableness. By means of such reviews, it is possible to bring into focus changes in rates which are desirable (even in the face of a natural aversion to any revision of existing schedules) to contribute to a more healthy state of business, to promote additional or new uses of electric service, and to eliminate possible inequities and discrimination under current rate schedules.

Rate making centers around two general principles which should be kept in mind when establishing rate schedules. The first principle is that

the income derived from the various rate schedules established must pay for all costs of service, and the second principle is that the rate schedules should not discriminate between consumers. In effect, this means that each consumer should pay the full cost of his service in so far as possible, without inequitable subsidization from other consumers.

Costs of Service

The costs of service, which must be met from the revenues produced by electric energy sales, include, among others, the following principal items:

Operation and Maintenance: This covers the cost of producing energy, the cost of power purchased from other utilities, and the cost of operating and taking care of the production, transmission, distribution and general plant properties.

Administrative and General Expense: This includes the general cost of doing business, together with corollary expenses such as sales promotion, customer accounting and collecting, meter reading, and the like.

Depreciation and Interest: This item covers the fixed charges associated with the investment required for the physical properties of the system.

Taxes or Payments in Lieu of Taxes: Included in this item are the ad valorem, sales, and other taxes or appropriations set aside therefor which are pertinent to utility operations.

From past records, and projected estimates, it is not too difficult to determine the total cost of electric system service for which compensation is to be received in the revenues to be obtained from existing and prospective rate schedules. The allocation of these expenses and costs among the various classifications of consumers on an equitable basis is a matter requiring careful analysis to avoid discrimination.

Allocation of Costs

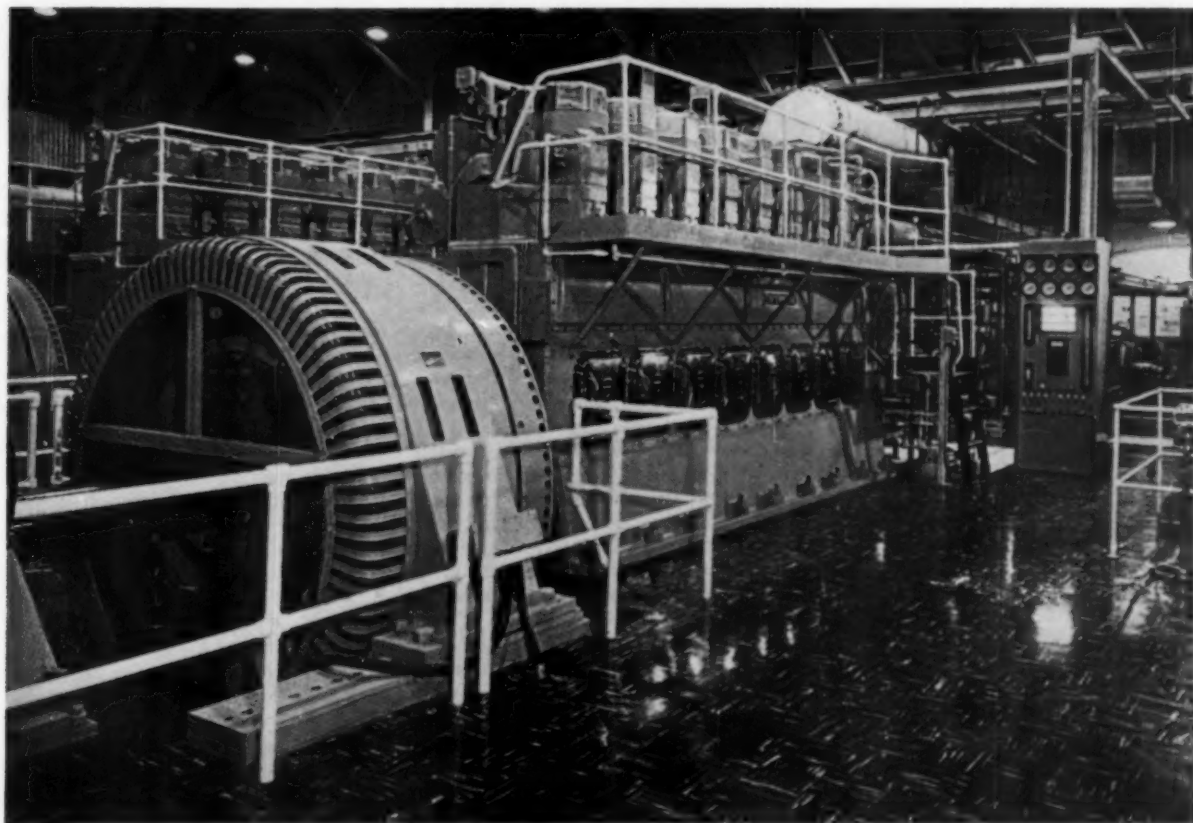
In general, the cost of serving commercial consumers is higher than the cost of serving residential consumers. There are several factors which may contribute to the higher cost of commercial service. One factor is the good voltage regulation and generally better degree of service required by commercial establishments, where outages during business hours mean lost production by employees, lost sales, and the hazards associated with power failure for elevator service, escalators and lighting. Another factor is that commercial load coincides with the industrial peak load during the mid-morning or mid-afternoon hours, and overlaps the residential peak load in the winter months. Commercial air conditioning loads are a major factor in determining the system peak load. Since much of the commercial load is located in congested districts, this generally requires an expensive underground distribution system. From this line of reasoning, it is evident that rates to commercial consumers may be higher than rates to residential consumers without discrimination between the two classes of consumers.

Industrial rates are competitive in nature, and are usually lower than residential or commercial rates. Large industrial consumers are often in a position to construct a power plant to produce their own energy requirements; consequently, the cost of energy to these consumers must be low enough to compare favorably with the cost of energy that may be generated by the consumer. Industrial rates applicable to such consumers may not pay the total pro rata costs of energy furnished; however, low rates for industrial service can usually be justified when the revenue produced by such rates is greater than the additional or incremental costs incurred in serving the industrial consumer. The difference between the revenue produced and the additional or incremental costs in-

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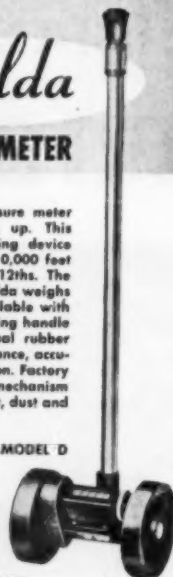
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curred will benefit the other consumers on the system by reducing the amount they must pay.

In the larger sense, a low industrial service rate geared to attract new industries into a city contributes to the well being of the city (and the utility) in the form of increased residential growth from new plant employees, and new plant payroll released through stores, shops and commercial establishments to help the business growth of the community.

In the preparation of a rate schedule for a class of consumers, there are three general types of costs which should be segregated and analyzed separately. These are the consumer cost, the demand cost, and the commodity cost.

Consumer cost is that part of the total cost which is, in general, proportional to the number of consumers, and which is more or less independent of the amount of consumption by the consumer or his maximum rate of consumption. Meter reading, customer billing, accounting, and collecting, and a portion of the administrative expenses are expenses which usually fall in this category. The total of all consumer costs can be divided by the number of consumers and the quotient obtained may be allocated to each consumer. This cost constitutes the approximate minimum cost of serving the consumer and usually influences the amount of the minimum bill.

Demand cost is that part of the total cost of operating a utility which is in proportion to the peak load or maximum demand which may be thrown on the system and which is more or less independent of the quantity of the commodity used. Since the plant equipment must be large enough to supply the combined peak demands of all consumers, the demand cost is basically the interest and depreciation on the investment in the production, transmission, and distribution plant properties.

The commodity cost is that part of the total cost which is proportional to the quantity of the commodity used and which is substantially independent of demand. Cost of fuel, lubricating oil, and cooling water are some of the items comprising commodity costs. A portion of the fixed charges on plant should also be included as a part of the commodity cost.

These three basic costs represent the theoretical approach to rate making and would be considered

ideal if such could be readily segregated and applied; however, from a practical standpoint they may be considered to serve only as a guide or possible goal when revising existing rate schedules or formulating new schedules.

For residential consumers, the typical rate is in the form of a simple block type schedule, with from two to four blocks selected to cover lighting, refrigeration and cooking, water heating and other services under a single schedule applicable to all residential consumers. The first block should pay all costs of energy consumed in the first block; that is, the consumer, demand, and commodity cost. The second and successive blocks should include only the demand and commodity cost with the demand cost being less in each successive block. In no case should the rate for the last block be less than the incremental cost of supplying the energy in that block.

Similar schedules might be prepared for small commercial consumers; however, it is desirable to have a demand and energy charge rate for the large commercial consumer. It is possible to design a combination design and energy charge type of schedule which has a maximum cost limitation established by a block schedule. Such a rate would be applicable to large as well as to small consumers.

Industrial consumers should preferably be placed on a demand and energy charge type of rate schedule. Such a schedule provides an incentive for the consumer to keep his load factor high, and also more nearly approaches the ideal system of rate making based on cost of service allocated to consumer, demand, and commodity costs.

Other provisions to be considered is establishing rate schedules and power supply contracts include such items as measurement of demand in KVA instead of KW, minimum charges, demand ratchets, discounts, power factor clauses, fuel cost adjustments, etc. In general practice, fuel adjustment clauses are not applied to residential rate schedules because the fuel cost represents a much smaller proportion of the residential bill than of the large commercial or industrial bills, and the extra accounting and billing operations for the large number of residential bills have discouraged its employment in domestic schedules.

It is apparent that numerous variations are possible in designing electric rate schedules, as evidenced

in the many rates published by the Federal Power Commission in the "National Electric Rate Book" for communities having a population of 2,500 or larger. In addition to providing schedules which will pay for the cost of service on an equitable basis, it is desirable to keep the number of schedules to a minimum, and in as simple a form as possible.

• • •

Tinted Glass Stops Heat of Sun

The handsome new office building of the Indiana Employment Security Division promised comfort and convenience for employees, but shortly after moving in, the occupants encountered a severe heat build-up in certain areas.

The building features a dramatic roof overhang supported by soaring fluted metal columns, with large areas of glass to give an open, spacious look. However, this open design with considerable glass exposure resulted in soaring temperatures inside the building despite the fact that vertical venetian blinds had been installed and the building was equipped with a zone-controlled air conditioning system. The heat load from the sunlight was too great to be blocked out by the blinds or absorbed by the building's air conditioning system.

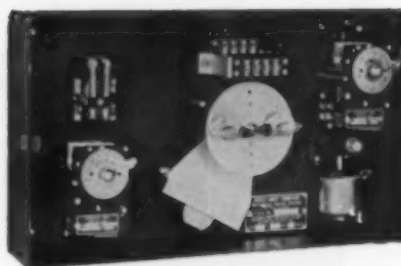
To control the amount of heat-causing rays of the sun entering the building, it was recommended that the windows on the south side be tinted with Sun-X glass tinting. This Du Pont window tint is an alkyd based liquid plastic product which is applied to installed glass by flowing it onto the glass surface with portable pressure equipment. The material dries quickly and forms a smooth, hard finish without optical distortion. The formula is available in 14 different transparent and translucent colors for combating various heat, glare and fade problems.

A gray transparent tint was selected for the Employment Security Building, both for its heat reduction properties and because it would blend well with the building's exterior features. Windows on the first and second floors—3,441 square feet of glass—were tinted. The windows on the third floor are protected from the sun by the overhanging roof. Reduced heat transmission will reduce annual operation costs for the building's air conditioning system, as well as providing better working conditions.

Sun-X Glass Tinting is distributed internationally by Sun-X International, Inc., Houston, Texas.

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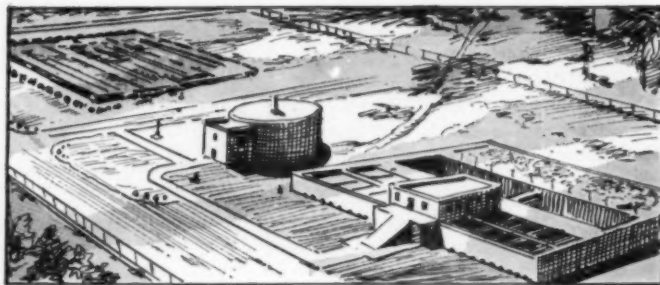
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THE SEWERAGE AND REFUSE DIGEST



Prepared by **ALVIN R. JACOBSON, Ph.D**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Anaerobic Contact Process

Previous findings of laboratory and pilot-scale investigations of the anaerobic contact process have indicated an excellent removal of suspended solids and a substantial removal of BOD upon passage of the sewage through a blanket of anaerobic sludge. A full-scale anaerobic contact process experiment was carried out by the authors in a subdivision of Peoria covering approximately 320 acres and serving about 450 homes to the present time. The treatment plant consists of an anaerobic contact tank, followed by a dosing tank, trickling filter, and a small oxidation pond. The effluent is discharged to a creek which is relatively dry during the summer months. After 20 months operation the anaerobic contact process as evaluated by this study has the following characteristics: 1) The average suspended solids removal is 77 percent. 2) The average BOD removal is 34 percent. 3) The mean rate of sludge accumulation is about 0.4 cu.ft. per capita per month, and the effective storage depth is 10 ft. in a 16-ft. water-depth tank. 4) The efficiency of BOD removal is adversely affected by increasing the depth of sludge. 5) The sludge formed has a disagreeable odor which can be removed by liming. 6) Scum is no problem. 7) The average retention period, consistent with good suspended solids removal, is below 13 hrs. 8) The BOD removal is adversely affected by summer temperatures, but the suspended solids removal remains approximately constant. 9) Very little attention is required for operation. The performance of the trickling filter was disappointing with lower BOD removals than anticipated. The oxidation pond, though overloaded,

effected a substantial BOD removal and produced a satisfactory effluent.

"The Anaerobic Contact Process In Practice." By Edwin B. Fall, Jr., Chemist, and L. S. Kraus, Manager, respectively, of the Peoria Sanitary District, Peoria, Ill. *Journal WPCF*, October, 1961.

Toronto Landfill Creates Parks

Metropolitan Toronto is creating new park lands and green areas from old swamps and other waste land at no cost to its 1.75 million citizens by the use of sanitary landfills for its refuse disposal. The first landfill operation was started in 1954 as a means of land reclamation after Hurricane Hazel swept down on the area leaving millions of dollars worth of damage. At that time decision was made to recover some of the expenditure necessary

to rehabilitate one of the most devastated areas where homes were swept from their foundations. The scheme was completed in 1958 with the land raised 25 to 30 feet and contoured into a beautiful 36-acre park. To date three projects have been completed, three more are in operation, and plans have already been envisioned which could result in a five-mile-long park along the metropolitan waterfront of Lake Ontario. Not only has the venture into landfill been successful but the operations are financially self-sufficient. Metro landfill operations provide the areas for disposal but Metro is not in the garbage collection business—that is the responsibility of the various municipalities which make up the metropolitan area, and the private contractors who undertake industrial refuse disposal. Expenditures incurred in fiscal 1960 were \$315,636.64 while revenue during the same period was \$349,730.67. During the year 191,583 loads were handled for disposal—an average of 750 loads per day.

"Metro Toronto Landfill Creates Many New Parks." A Staff Report. *Canadian Municipal Utilities*, October, 1961.

Tough Trenching



● **DIGGING** through hard coral for a new sanitary sewer in Miami, Fla., this Parsons Trenchliner carves out a trench 66 ins. wide and 16 ft. deep.

Temporary Pumping Stations

A minor though significant factor in the development of the overall sewer expansion program in the City of Phoenix, Arizona, was the contribution of a number of temporary pumping stations utilizing submersible pumps. It was obvious four years ago that in order to meet the needs of the rapidly expanding community it was necessary that some means be devised so that new developments could be provided with sewerage service at the outset. An ordinance was passed which permitted developers to finance the



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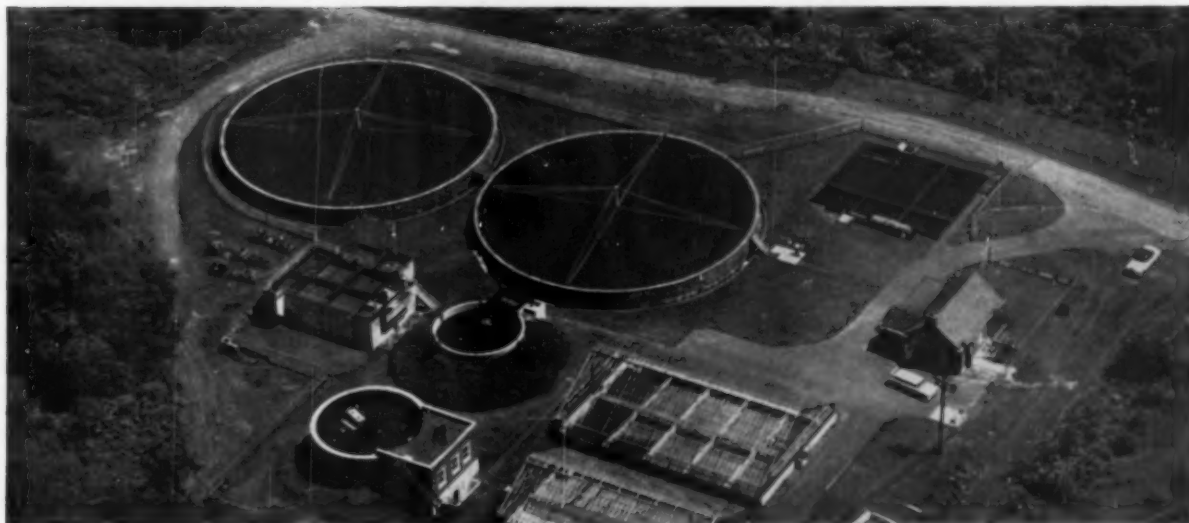
In the heart of one of Pennsylvania's most beautiful resort areas is the thriving community of Stroudsburg. Its sparkling streams and invigorating mountain air have not only made this an attractive residential area but inviting to industry as well.

As in over 200 other communities in the United States, Stroudsburg's sewage treatment plant is enhanced by the benefits of a P.F.T.-Pearth Gas Recirculation System.

P.F.T.-Pearth steps up gas production, eliminates scum and increases digester capacity. Compressed digester gas is injected through properly spaced discharge wells into the zone below the scum layer. Violent agitation disperses the scum and effects intimate mixing of the scum and raw solids with the seed material in the active digestion zone. This steps up digestion of all solids.

There are no moving parts in the digester and no restrictions in the open end gas discharge piping. There is no danger of mechanical failure or clogging with this trouble-free system.

Other P.F.T. equipment at Stroudsburg includes: 1 P.F.T. 30' Floating Cover, 1 P.F.T. 35' Floating Cover with P.F.T.-Pearth installed in 1954. 1 P.F.T. #250 Heater & Heat Exchanger Unit, P.F.T. Supernatant Selector and Gauge and P.F.T. Gas Safety Equipment. Plant designed by Albright & Friel, Consulting Engineers, Philadelphia.



Aerial Photos Shows Stroudsburg Plant with P.F.T. Floating Cover with Pearth in Foreground.



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PUBLIC WORKS for December, 1961

133

construction of the connecting sewer main with a provision for repayment from future connectors on a pro rata share basis. But it remained for the utilization of simple, temporary pumping stations to provide a solution that was acceptable from the developers' point of view as well as fitting the pattern of overall integration of the sewer system. Submersible pumps provided many features that could be utilized in a relatively low cost pumping station. They permitted the location of the station within the limits of the public right-of-way thereby eliminating the cost of a pumping station site. Likewise, eliminating motors and other appurtenances from surface location made security fencing unnecessary. A single pump submersible-type pumping station was adopted as a standard. A daily routine inspection of all pumping stations is made to observe their operation and to perform necessary maintenance or to replace pumping units. When daily routine turns up malfunctions or abnormal operation, two-way mobile radio communication makes it possible to dispatch a maintenance truck immediately. These temporary pumping stations have made

it possible for the Phoenix sewer system to absorb expansion problems without undue difficulty, in many cases preventing the installation of tanks and cesspools. Moreover, the lateral sewers are installed in accordance with master planning, to permit adjacent areas to benefit in the future in spite of "hop-skip-and-jump" subdividing.

"Temporary Sewage Pumping Stations." By Art F. Vondrick, Assistant Water and Sewers Director, Phoenix, Arizona. PUBLIC WORKS, November, 1961.

Syracuse Treatment Plant

A study of the sewage disposal problems of the entire Syracuse Metropolitan area completed in 1952 recommended that one sewage treatment plant be constructed to serve the city and the communities in the West Side Sanitary District. A novel feature of this plan was the recommendation that the treated effluent be pumped six miles around Onondaga Lake to the Seneca River, thereby minimizing the problems of aquatic growth in the lake which has a great potential for recreational uses if the pollution can be brought under control or elimi-

nated. Another feature of the proposed plant was to have a design capacity to handle all flow reaching the site even under maximum storm conditions. It was determined that primary treatment would be required during the non-recreational months, with chemical precipitation and chlorination during the swimming season. The flow diagram of the treatment plant is shown in the article; also a series of photographs accompany the detailed description of this sewage treatment plant.

"Metropolitan Syracuse Treatment Plant." By Samuel W. Williams, Jr. O'Brien & Gere, Consulting Engineers, Syracuse, N.Y. *Water & Sewage Works*, October, 1961.

From Sewage To Milorganite

Since 1925 the City of Milwaukee has provided secondary treatment of its sewage by means of the activated sludge process. In that year the Milwaukee Sewerage Commission built an 85-mgd plant on Jones Island for the treatment of sewage and industrial wastes. At the present time annual sales of 70,000 tons of dried activated sludge have helped



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20 percent more pick-ups a week, collections would
cost 24.5 cents each . . . for a saving of 3.9 cents
per collection. That's a saving of \$39 per thousand
. . . over \$2,000 in one year, \$10,000 in five
years! Let your Heil distributor tell you more
about the savings you can make.



COLECTOMATIC REFUSE BODIES

Factories: Milwaukee, Wis.; Hillside, N. J.; Lancaster, Pa.;
Cleveland, Ohio; Modesto, Calif.

THE HEIL CO.

MILWAUKEE 1, WISCONSIN

Milwaukee to get full value from its sewage works. Sewage flows into eight grit chambers, then through a series of rotary drum screens, into mixing channels where controlled volumes of return activated sludge are applied, then into the aeration tanks. From the aeration tanks in the two treatment units—of 83 and 115-mgd capacities—the mixed liquor flows into the clarifiers where it is aerated for an average period of 6 hours. Activated sludge is removed by quiescent settling in Dorr and Tow-Bro type clarifiers. The settled sludge is conditioned with ferric chloride and dewatered on

24 Oliver vacuum filters. The filter cake is transferred by means of a series of rubber belt conveyors to 10 direct-indirect-counter-flow rotary drum-type dryers where it remains for about 45 minutes. The moisture content of the dried material is about 5 percent. The sludge is processed into an evenly graded granular material, containing 6 percent nitrogen, 4 percent phosphate, 0.4 percent potash and a wealth of trace elements which make it suitable as a lawn and grass fertilizer and soil conditioner. It is sold under the trade name of "Milorganite." The total cost of the treatment

plant and intercepting sewers, approximately \$80,000,000, was financed by sale of county bonds issued for the Metropolitan District. A master plan of improvements has been adopted to meet the sewage treatment needs for the metropolitan drainage area to the year 2,000.

"From Milwaukee Sewage to Milorganite at Jones Island." By Ray D. Leary, Chief Engineer and General Manager, Milwaukee and Metropolitan Sewerage Commissions, Milwaukee, Wisconsin. *Wastes Engineering*, October, 1961.

"Operation Cleanup"

Miami, Florida's, recent Operation Cleanup—a crash program for pick-up of items not normally collected in their regular waste collection and disposal services—netted a total of 4,714 tons of refuse material. The Miami Metropolitan area being the hub of Dade County claims about one million residents; additional millions visit the area on business or on vacation. The program was so well accepted by the local people that semi-annual clean-up programs are being considered—a spring clean-up, paint-up drive as well as a clean-up drive just prior to the South Florida winter season. Considerable advance planning made the undertaking a success. In addition, excellent cooperation was extended the City of Miami Publicity Department by the various media such as press, radio, and television. The city was divided into sections and the residents were informed by handbills and the news media when the collection crews would be in the area for the scheduled pick-up of waste materials. The clean-up drive was also a fire prevention measure, residents being urged to clean out closets and garages of combustible waste materials. A total of 18 Hydro and Davis cranes, with clamshell buckets designed for picking up yard rubbish, together with 80 trucks and 200 employees participated in Miami's first "Operation Cleanup" in 20 years.

"Operation Cleanup" Yields 4,700 Tons of Waste." By J. Grady Phelps, Superintendent, Division of Municipal Wastes, Miami, Florida. *PUBLIC WORKS*, November, 1961.

Refuse Disposal Engineering

Refuse collection and disposal should be handled as a materials handling project, where industrial

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90% of the Cities in the United States use this ROD for cleaning sewers . . .

THERE MUST BE A REASON!

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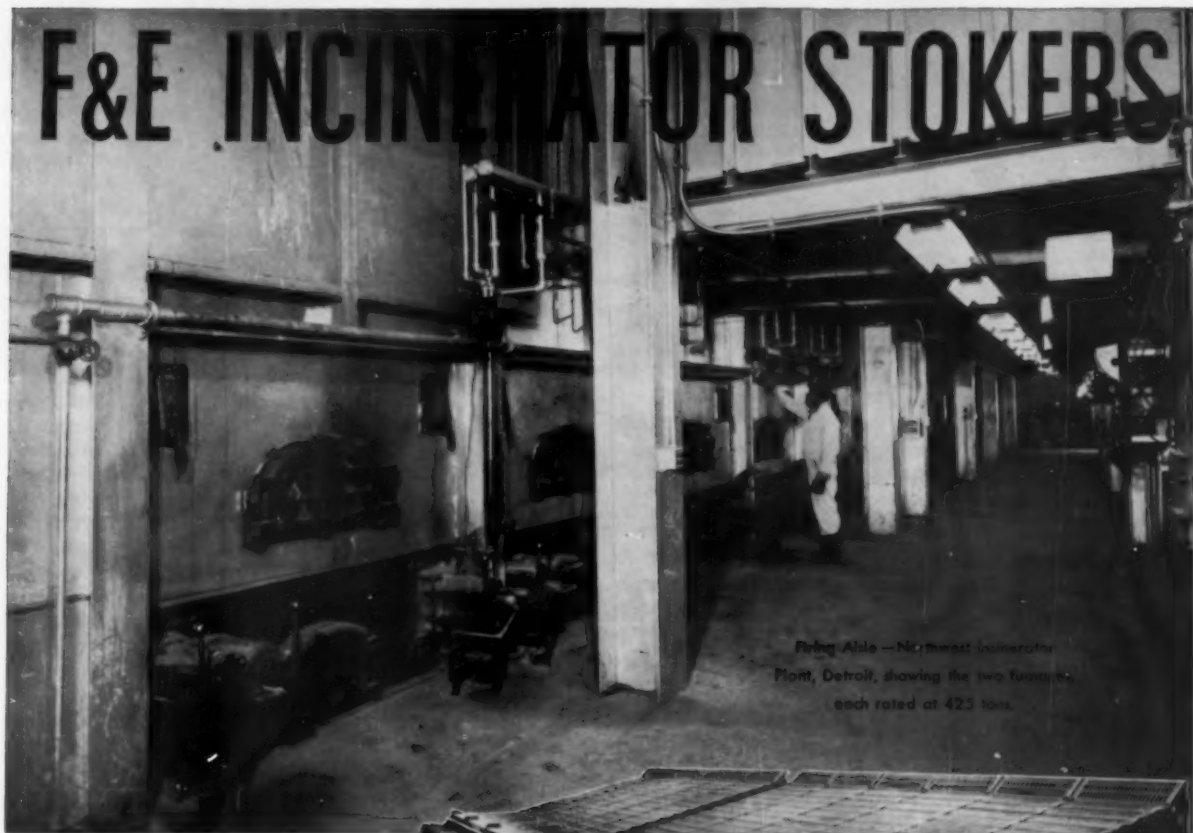
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DETROIT to install TWO MORE

F&E INCINERATOR STOKERS



Being Alas — Northwest Incinerator
Plant, Detroit, showing the two furnaces
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TOTAL CAPACITY WILL BE INCREASED TO 3,000 TONS OF MIXED REFUSE DAILY

Seven F&E Multi-Cell Incinerator Stokers, with a total rated capacity of 2,325 tons of mixed refuse daily, are already in use in the various plants in the City of Detroit. Operating experience shows that all units easily exceed their nominal rating in normal operation, resulting in substantial savings to that city.

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According to Mr. Theodore E. Winkler, Engineer of Waste Disposal, the City of Detroit will have a total rated capacity of 3,000 tons when the two F&E Incinerator Stokers now on order are installed.



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T-Lock Amer-Plate meets all the requirements of the ideal sewer lining:

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- T-Lock has a smooth, highly abrasion resistant surface... maintains its N factor of .010 indefinitely.

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engineering practices and time and motion study can aid greatly in increasing efficiency and reducing costs. Large sums can be wasted, or saved, according to the degree of planning and the study of local conditions which are different in every neighborhood or town, varying greatly according to climate, topography, local habits of the people and population density. Garbage and refuse disposal service comprises four interdependent stages: a) the storage, b) the collection; c) the transportation, and d) the final disposal of the waste materials. The author describes each of these aspects in detail, comparing English practices with those in the United States and other parts of the world. Frequent analyses and determination of costs of all phases of the collection and disposal service are always worthwhile. Comparison should be made between collection crews and analyses from other towns or cities of comparable size and problems. The composting of garbage is described in some length as it is practiced in other countries. The author concludes by stating that the collection and disposal of town refuse is an engineering problem of considerable complexity, where the promotion of hygienic standards must be given top priority.

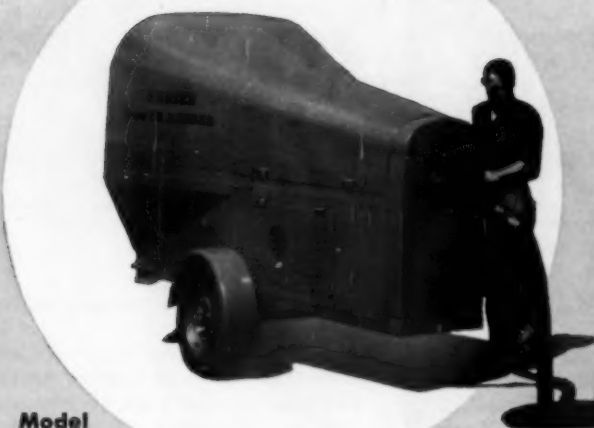
"Engineering Aspects of Town Refuse Disposal." By J. L. A. Watson, M.B.E., M.I. MUN.E., F.R.S.H., Engineering Advisor, Ministry of Health, Jerusalem. *The Surveyor and Municipal and County Engineer*. 23 September, 1961 (London).

Other Articles

"Rapid Coliform Organism Determination With C_{11} ." The radioisotope test is used to shorten the time required for coliform determination to several hours. By Gilbert V. Levin, Vice President-Engineering, Resources Research, Inc., Washington, D. C.; Virginia L. Stauss, Research Assistant, Department of Biology; and Walter C. Hess, Associate Dean, School of Medicine and Dentistry, Georgetown University, Washington, D. C. *Journal WPCF*, October, 1961.

"Locating Leaky Sewers With Smoke." A portable blower and some smoke bombs help locate leaks in newly laid sewers before backfilling and in old sewer lines. By C. E. Stacey, City Engineer, McPherson, Kansas. *Public Works*, November, 1961.

"TV Camera Inspects 1,000 Feet of Sewer A Day." This technique is proving to be a valuable time-saver in the sewer maintenance program. By R. G. Kramer, City Engineer, Waukegan, Illinois. *Public Works*, November, 1961.



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SECTIONAL ROD

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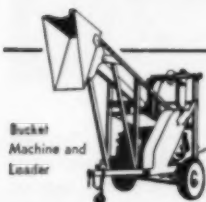
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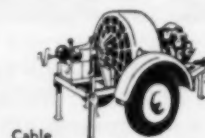
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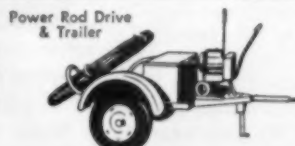
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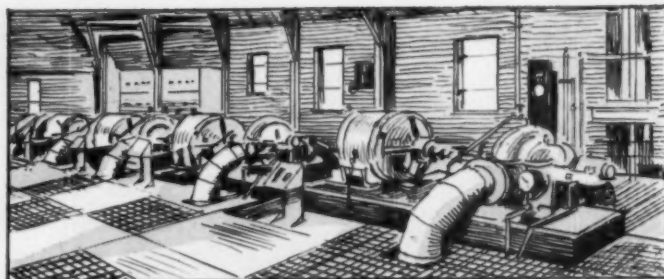


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THE WATER WORKS DIGEST



Prepared by ALVIN R. JACOBSON, Ph. D.

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Frogmen Inspect Watermains

The Department of Public Works in the City of Montreal, Canada, has used frogmen to do surveys of their water aqueduct and sewer systems. The first stage of the work was a survey of the waterworks pumping stations and of a maze of mains connected to large chambers in which frazil ice is a constant and serious problem during the severe winter months. Another phase of this survey was the inspection of the screens located at the entrance of four main intakes. Damaged and clogged screens were discovered. They were completely cleaned of dead leaves, papers and foreign objects. The frogmen also made a report of the condition of the filtration chambers and on the automatic gates which regulate the rate of flow. Underwater photos were taken to give the engineers a clear picture of the problems they had to face. The divers also examined the discharge from sewage outlets during the winter months when ice jams caused a severe problem. To eliminate this, high pressure pumping stations were set up to eject the used water. Frogmen also carried out surveys of sediment beds in sewers enabling the engineers to devise new methods of cleaning them. In others it was shown that deposits of fatty matter and oil, forming a gel-like substance, had considerably reduced the diameter of these sewers. The report submitted by the frogmen enabled the engineer to work out ways and means of eliminating the obstructions and of re-establishing good flows where needed. These specially trained and equipped type of mobile divers, who carry out all phases of underwater work, are well qualified to do inspection work on submerged parts of water and sewage works.

"City of Montreal Uses Frogmen to Inspect Watermains and Sewers." By R. Sonne, International Underwater Contractors Ltd., Montreal, Quebec. *Canadian Municipal Utilities*, September, 1961.

Water Use in the U.S.

The United States is not running out of water as so many popular and technical writers would have us be-

lieve. In many places users may not have all the high-quality water they need at the price they would like to pay, and in a few places they may never have enough but the United States is not running out of water nation-wide or even in large river basins. These are the conclusions of the United States Geological Survey after a survey of our national water resources. The USGS has just completed an estimate of the water used during 1960, and has

Handling Chemicals for Water Treatment



THE South Holly water treatment plant of the Fort Worth, Texas, Water Department uses two Thomas bucket elevators and five Thomas screw conveyors to handle coagulating chemicals. Delivered to the plant by railroad hopper car, alum and lime are dropped by chute to separate 9-in. Thomas conveyors and transported to twin Thomas elevators with malleable iron buckets. The alum is transported from

its elevator by conveyors to the alum storage bins. Another conveyor receives the lime from the second bucket elevator and delivers it directly to the lime bin. The entire conveyor system is powered by five 230 rpm class II gear head motors. Micro-switch equipment and overflow doors operate automatically in the event that any of the storage bins becomes loaded above the designed 200-ton capacity.



**WHEN BUYING HYDRANTS LOOK FOR
A MANUFACTURER WITH AT LEAST
100 YEARS' EXPERIENCE**

Age has its advantages when you are dealing with fire hydrants, because hydrants must provide many years of reliable service. When a manufacturer has been in business 100 years or more, the quality of his product is well known.

R. D. Wood Hydrants have stood the test of time. There are more than a million

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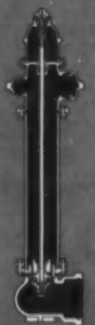
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made comparisons with the estimates for 1950 and 1955. Estimates were made for: public supplies, irrigation, rural use other than irrigation, and self-supplied industrial use. Of the 270,000 mgd of water withdrawn from ground or surface water sources, self-supplied industry withdrew the largest quantity (51%), irrigators withdrew the second largest quantity (40%), public supplies withdrew 8% and self-supplied rural users withdrew the smallest amount (1%). The consumption pattern, however, is entirely different, the irrigators con-

sumed the largest quantity of water (85%), public supplies consumed the second largest quantity (6%), self-supplied industries 5%, and self-supplied rural users consumed 4%. Climate has a very pronounced effect on the pattern of water use; the warm, dry climate, as in the semi arid parts of the United States, using higher rates. Irrigation, the largest use of water in the western U.S. is highly consumptive. More than 90 percent is used in the seventeen states, and about 66 percent of the water applied to the land is consumed. The pattern of industrial

use is just the reverse; 85 percent of the industrial water being used in the East with only about 2 percent being consumed. About 80 percent of the water consumed in the U. S. is consumed in the West where this part of the country has only about 25 percent of the U. S. water supply; the greatest depletion occurring where it can be least afforded.

"Water Use In the United States." By Kenneth A. MacKichan, Hydraulic Engineer, USGS, Ocala, Fla. *Journal AWWA*, October, 1961.

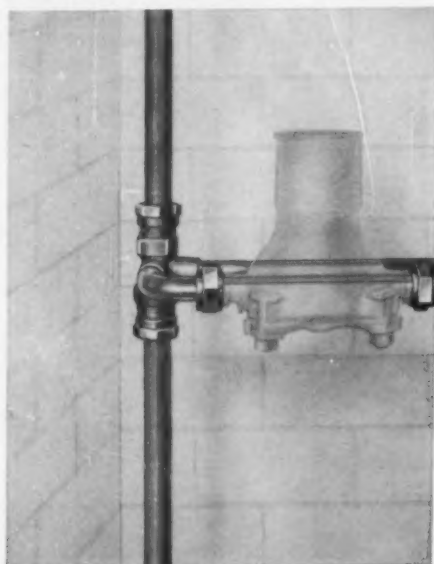
Color Removal

A new water treatment plant was put in operation in May, 1960, in the Borough of Ballymena, Northern Ireland, which enabled the consumers to have a colorless water for the first time. The very marked color of the water, as high as 200 ppm at certain times, was due largely to the presence of peat in the watershed. The treatment plant comprises essentially of two hopper-bottomed vertical flow sedimentation tanks and four rapid sand gravity filters. Water flows from the Quolie watershed into the flash mixing chamber where alum is added as the coagulant at dosages of 80 to 90 ppm found necessary for color removal. Soda ash or sodium aluminate may be added under certain circumstances for maintaining the optimum pH value. From the mixing chamber, the water is discharged downwards through inlet pipes into the hoppers of the sedimentation tanks, and is collected at the surface in asbestos troughs suspended between the tank walls. As the water rises in the hopper, the floc is left behind as a sludge blanket, a part of the sludge being intermittently or continually removed by small bore bleed pipes. The water from the sedimentation tanks then flows to the gravity filters. The filtered water collected in the non-corrodible underdrain system is pumped either into the distribution system or the storage reservoir. Chlorine is added for sterilization purposes and pH is adjusted through addition of lime.

"Ballymena Gets Colorless Water for the First Time." By the Staff. *Municipal Engineering*, September 22, 1961. (London)

County Solves Water Problems

In 1961, a 13-year old dream became a reality for Niagara County, N. Y., when the new 12-million gal-



For Setting Meters in Basements



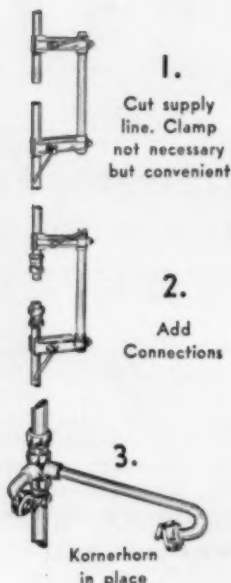
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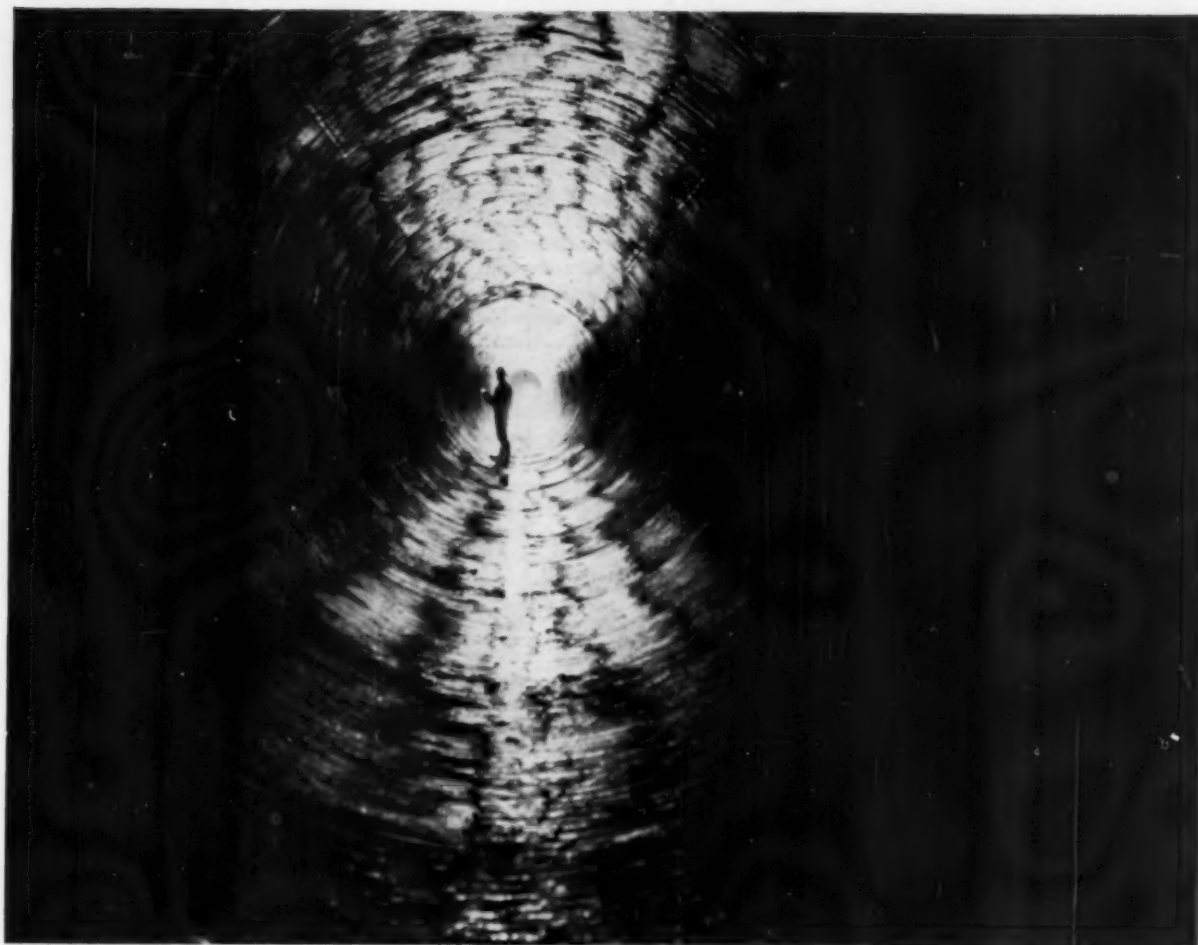


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FOR BETTER WATER SERVICES

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FORD



An engineer of Quebec's Hydro-Electric Commission examines the Bitumastic coatings inside the huge Bersimus penstocks.

Bitumastic lining stands up like new in high pressure penstock service

The most critical points in the giant Bersimus River penstocks are the eight 328-foot steel pipe sections, located immediately below the elbows, where water pressure reaches 540 pounds per sq inch. Quebec Hydro-Electric Commission engineers picked Bitumastic coal-tar enamel for the protection of the steel pipe in this tough service.

The coatings applied to this section had to meet very stringent requirements: first, the high moisture content inside the penstocks made it necessary to use a very fast drying primer to protect the coating's bonding action from moisture attack. This requirement was fully met by Bitumastic Jet-Set Primer, the fast-drying primer with a bond estimated to be five times stronger than other primers.

Two coatings of Bitumastic No. 70-B AWWA Enamel were applied to meet the other requirement: these top coatings will have to provide a minimum of five years maintenance free service. A recent over-all inspection of the line indicated that the coatings are still in excellent condition and should last 40 years or more, based on previous experience.

Koppers coal-tar protective coatings are ideally suited for severe corrosion conditions where water resistance and maintenance free service are mandatory. For more information on how Bitumastic coatings can solve your corrosion problems, mail the coupon or write: Koppers Company, Inc.,

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ion treatment plant was completed, furnishing water to more than a dozen towns and villages in Niagara County, as well as the neighboring Orleans and Erie Counties. The Niagara County Water District is unique in that its prime purpose for existing is to supply, under pressure, treated water to points of take-off on a wholesale basis, making it economically possible for the various communities to develop their own distribution system. Some 300 miles of new distribution system have been constructed since water was made available in the County mains. The entire system costing ap-

proximately \$10 million has as its source, the West Branch of the Niagara River. The raw water pumping station discharges the water into the 12-million gallon treatment plant. The treatment process employs a centrifugal type rapid mixing tank coupled to three Pfaudler-Permutit horizontal type rapid updraft precipitators, and six rapid sand filters using Wheeler bottoms and equipped with Palmer surface wash sweeps. Alum and lime are used as coagulants and either bentonite or calcite as coagulant aids. Pre or post-chlorination or chlorine dioxide may be added

as desired. Fluoride treatment is added by means of a hydro-fluo-silicic acid feeder.

"Niagara County Solves Its Water Problems." By Leon H. Wendel, Consulting Engineer, Lockport, N.Y. PUBLIC WORKS, November, 1961.

Cairo's Improvement Program

The City of Cairo, Ga., completed in 1960 the first phase of a \$500,000 water system improvement program to overcome certain serious deficiencies in its water supply. Spurred on by a series of complaints, beginning in the summer of 1957, concerning the water service—unpleasant taste and odor, black or "dirty" water and periods of low pressure—the city obtained the services of consulting engineers to make a thorough investigation. It was clear, however, that even if the most economical combination were selected of the several methods which could be proposed, a complete and ideal solution to these problems was beyond the City's financial ability. An estimate of the cost of the ideal solution was in excess of \$500,000 while the financing capacity of the city was about ½ of this amount. In 1959 financial negotiations were successful for obtaining money for three contracts for the following water works improvements; Water plant facilities, including a ground storage reservoir, aerator, chlorination facilities and high service pumps costing about \$83,000; additions to the water distribution facilities including extensive new segments of 6-inch costing approximately \$28,000. These improvements furnish an economical answer to the City's treatment, storage and pumping problems for the near future and give the city time to deal with the long-term problems whose solution remain for the future.

"All Cairo, Ga., Could Afford Was \$200,000 of a \$500,000 Program." By Vincent Protheroe, Design Engineer, Smith & Gillespie, Engineers. *Water Works Engineering*, October, 1961.

Water Research Program

The Water Research Association has recently moved into new laboratories located beside the Thames River at Medmenham in Buckinghamshire. These new facilities will permit the Association to expand its activities into various phases of research to meet the increasing demands for pure water. The Chemistry Division is conducting research



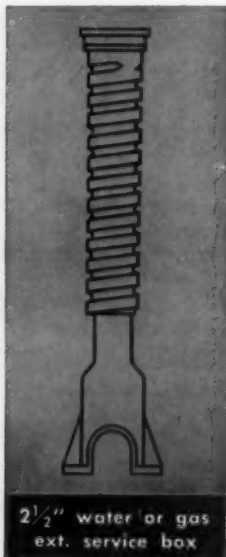
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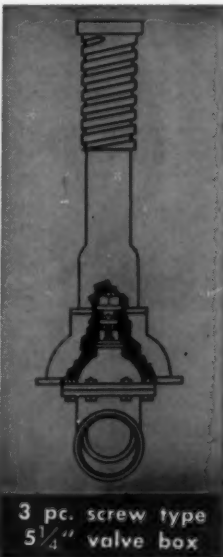
No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.



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into the coagulation process to determine the optimum pH ranges for effective coagulation with the various coagulants that may be used; the effects of electrolytes on coagulation; and the precise nature of the interaction between suspended matter and the hydroxide formed as a flocculating particle. Another area of study by the Chemistry Division is the isolation of organic matter causing color in natural raw waters. A method has been developed based on a combination of adsorption on carbon and ion exchange. The Physics Division is concerned principally with the application of plastic materials to the construction of water mains and service pipes; with methods of instrumentation particularly for the detection of leaks; and with the analysis of water distribution networks. A Biology Division is concerned with a wide range of subjects including aspects of water sterilization, the speeding up of bacteriological examination and the control of algae in water reservoirs. A new full scale water purification plant is now being designed and will be constructed in the pilot plant laboratory to investigate existing water treatment processes, to develop from the find-

ings of the chemistry division new processes which may be applied to full-scale waterworks plant, and to investigate particular problems which may occur in the plant of members of the Association.

"Research Helping to Meet Growing Demand for Water." A Staff Report. *The Surveyor and Municipal and County Engineer*, 30 September, 1961. (London)

Major Water System Changes

Every public works project, i.e., freeways, airports, storm drains or urban renewal, requires major water system changes. While Los Angeles has experienced record-breaking growth in recent years, other metropolitan areas can also point to equivalent urban expansion requiring major changes in their water system installations to accommodate continuing major public works improvements. However, coordination is a vital key to economy and successful water service in making these adjustments and changes. With a 50% growth in population since World War II, the City of Los Angeles has been faced with substantial changes in economic ac-

tivity, need for extensive new housing developments, improvement and expansion of transportation facilities, storm drain and channel structures to control destructive runoff, and facilities to dispose of waste water. In addition to the new growth there have been some extensive urban redevelopment projects. In the postwar years these developments have resulted in expenditures in excess of \$7 million to make the water system compatible with the new construction. This postwar water system adjustment cost has been allocated as follows: 1) For freeway adjustments, \$4,000,000; flood control adjustments, \$2,000,000; urban renewal adjustments, \$700,000; airport expansion \$100,000, arterial improvements, \$100,000 and new sub-divisions, \$100,000. The author has cited several examples in which the adjustment costs were reduced considerably, resulting in savings of over 50%, through careful coordination of activities between the water supply engineers and others.

"As Los Angeles Grows So Grows Its Water System." By Samuel B. Nelson, General Manager-Chief Engineer, Dept. of Water and Power, City of Los Angeles, Calif. *Water Works Engineering*, October, 1961.

MODERN COATING SYSTEMS

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Other Articles

"Analyzing Water Systems With the McIlroy Third Network Analyzer." A network analysis may reveal bottlenecks or weak links in a water system, effect of future loading conditions on present facilities, and alternate loading and operating conditions. By Robert C. Moore Director of the Computer Center, Western New England College, Springfield, Mass. and Analyzer Design Engineer, Standard Electric Time Co., Springfield, Mass. Journal NEWWA, September, 1961.

"Analysis of Water Demand from Meter Records." Use of punched card machine billing permitted correlation of meter records with factors affecting rate of water use on peak days. By Dan A. Brock, Dept. of Water Works, City of Dallas, Texas. PUBLIC WORKS, November, 1961.

"Algae and Other Interference Organisms in Water Supplies of California." A comprehensive discussion of the important place that aquatic organisms have in the water supplies of the Southwest. By C. Mervin Palmer, Biologist, Robert A. Taft Sanitary Engineering Center, USPHS, Cincinnati, Ohio. Journal AWWA, October, 1961.

"Solar Stills. Operating Experiences With Natural and Forced Convection." By Werner N. Grune, Ross B. Hughes and T. Lewis Thompson. Prof. of San. Eng. and Graduate Research Assistants, School of Civil Engineering, Georgia Institute of Technology, Atlanta, Ga. Water & Sewage Works, October, 1961.

NEWS OF ENGINEERS

A consulting engineering and land surveying firm has been formed by E. J. BARTON, K. R. BROWN, J. E. CLYDE and F. A. LOGUIDICE, under the name of Barton, Brown, Clyde & Loguidice, with offices in Northern Lights Office Park, North Syracuse 12, N. Y.

W. ORME HILTABIDLE, retired vice-admiral, USN, has joined De Leuw, Cather & Co., consulting engineers of Chicago as consultant. Admiral Hiltabidle will have offices at 1308 18th St., Washington 6, D. C.

D. GRANT MICKLE, with the Automotive Safety Foundation since 1943, has been appointed Deputy Federal Highway Administrator.

J. C. WOMACK, California State Highway Engineer, has been elected president of AASHO and JOHN C. MACKIE, Michigan State Highway Commissioner has been elected first vice president.

W. A. BUGGE, Director of Highways of the State of Washington, received the Thomas H. MacDonald Memorial award at the recent AASHO meeting in Denver, Colo.

C. FRED GURNHAM, head of the Department of Chemical Engineering, Michigan State University, has resigned and will enter practice as consulting chemical and sanitary engineer, specializing in industrial wastes.

H. M. FORD, formerly of the Department of Resource Development of Wisconsin, has joined the staff of Mead & Hunt, Inc., consulting engineers of Madison, Wisc., as coordinator of planning and development.

ROBERT W. NEILSON, long-time Director of Public Works of Winston-Salem, N. C., has been hon-

ored by the Board of Aldermen of that city. The new water plant under construction on Frye Bridge Road has been named the "Robert W. Neilson Water Treatment Plant." Mr. Neilson's many positions with the city have included rodman, instrument man, draftsman, field engineer, water and sewer engineer, city engineer and assistant superintendent of public works. He has been director of public works since 1953 and in the service of the city since 1914.

JOHN B. SMITH has retired after 48 years of service with the Helix Irrigation District, El Cajon, Calif., and its predecessor organizations. Starting as a water boy when he was 17, Mr. Smith has served in a number of capacities with the District. BYRON M. MILLER, General Manager of Helix, was in charge of the retirement ceremonies.

Largest Factory-Built Sewage Pumping Station

ONLY ONE DAY was required to install a 36-ton prefabricated reinforced concrete sewage pumping station to serve Rittman, Ohio, a city of 5,600 located near Akron. The installation is said by the manufacturer, Liftmaster, Inc., to be the world's largest factory-built pumping station.

Two 30-hp variable speed pumps are provided, with a combined capacity of 3,700 gpm. The design average flow of the project is computed at 740 gpm. The system is so designed that the pumps alternate flow loads and automatically adjust themselves to the flow rate.



The station consists of three chambers or stories, each of which is 8½ ft. high and 9 ft. in diameter. Walls are 6 ins. thick and interiors are ceramic-tiled. The units are buried underground, one upon the other, with a descent ladder connecting the three. Only an access door is visible above ground. Air circulating throughout the station undergoes a complete change every minute.

The pumps, valves, motors and piping are contained within the bottom chamber. Switch gear, variable speed controls, electrical panels, automatic greasing system and air compressor panels are in the middle chamber. The top chamber serves as a landing and a storage area.

Each chamber is cast of 9 tons of concrete, in which is imbedded 1,200 pounds of reinforcing steel rods. The chambers are steam cured. Each is fully insulated, with an inch of Styrofoam within the walls, 2 inches of fiberglass around the piping, and 1¼ inches of Foam Glass in the floor. A 3-ton concrete roof covers the top chamber.

Cost of the pump station was \$23-500. The over-all contract cost was \$35,800, which included installation of a wet well in addition to the sewage pump station. Alden E. Stilson & Associates, Columbus, Ohio, were the consulting engineers for the project. Pacific Building Corporation of Akron, Ohio, was the contractor.

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if you're looking for culvert that lasts



This mark tells you a product is made of modern, dependable Steel.



This 232-foot-long culvert will carry irrigation water under a new four lane highway near Livingston, Montana. It's made from USS AmBridge Sectional Plate: a tough, zinc-coated corrugated steel product that's famous for long life. Many steel culverts like this one have already outlasted the highways they were buried under.

USS AmBridge Sectional Plate is available in a complete range of sizes and is fabricated to meet all federal and state specifications. It's highly corrosion resistant and is pre-punched for fast assembly. Just smooth the grade line, set the sheets into place, bolt them together and then backfill. No need to build forms or sit out costly curing time.

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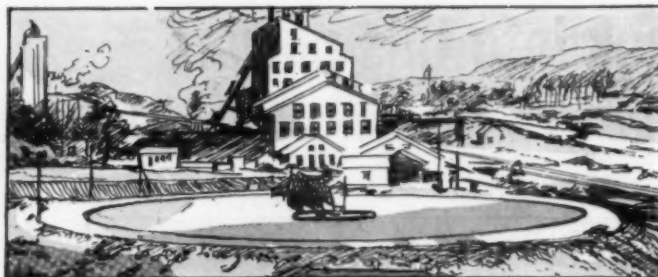
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United States Steel**

THE INDUSTRIAL WASTE DIGEST



Prepared by **CLAYTON H. BILLINGS**, Associate Editor

Smog and the Auto Crankcase

One of the sources of hydrocarbon emissions to the atmosphere has been found to be automobile crankcase ventilation systems. Since the 1920's, automobiles have employed crankcase ventilation to reduce condensation within the crankcase. These involve various means of drawing air through the crankcase to scavenge out blow-by gases escaping to the crankcase past the piston rings.

The volume of gases discharged to the atmosphere by crankcase ventilation systems is small compared with exhaust gases from automobiles, but the emissions are rich in unburned hydrocarbons and consequently account for 16 to 22 percent of the total hydrocarbon content of exhaust gases. In view of this, American automobile manufacturers began offering crankcase emission eliminators as accessories and beginning with 1961 models installed them upon all cars destined for the California market. Two basic types are available, the variable orifice metering valve system and the direct vent tube system, both of which offer a means of returning the blow by gases to the carburetor. To install the former on new cars costs about \$6 and \$11 to \$35 on used cars; the latter cost is \$3 on new cars and \$5 on used. A pilot study was conducted by the County of Los Angeles on 94 of the county fleet-vehicles. The study lasted nine months and involved 1.5 million vehicle miles. No increase in maintenance costs resulted. While some build-up of combustion chamber and induction system deposits occurred, these are not expected to measurably increase the cost of engine maintenance. It was concluded that the emission control systems effectively reduced the amount of

hydrocarbons discharged from the crankcase.

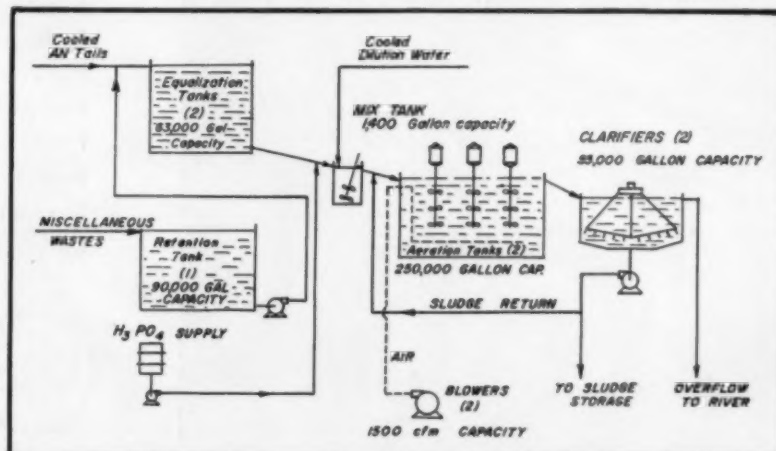
"A Study of Crankcase Ventilation Control Device Installations on the Los Angeles County Fleet." By Wallace Linville and William H. Parmelee. Report of the Los Angeles County Air Pollution Control District, June, 1961.

Acrylic Fiber Air and Water-Borne Wastes

When plans were made to construct facilities for the manufacture of Orlon acrylic fiber at Dupont's Waynesboro works, methods of waste disposal were considered. It was decided to develop a method of destroying completely the organics in the solvent recovery heads, principally odoriferous dimethylamine, thereby eliminating air pollution and liquid BOD potential. Further, the possibility of biochemical oxidation of the remaining wastes was investigated. The odor and BOD problems of the solvent recovery heads were readily solved by a combination of direct and catalytic

combustion. Using an oxidation temperature of 300°C and a 90-ft. discharge stack, the dimethylamine concentration was reduced below the threshold odor concentration. The liquid wastes containing acrylonitrile and dimethylformamide and a BOD of 5,000 lbs. per day were found to be treatable by an activated sludge process. Problems were anticipated with the high nitrogen content (denitrification interfering with sludge settling); with increasing acidity upon oxidation (controllable by lime additions); and a deficiency of phosphorus (controllable by phosphoric acid addition). Arrangements were made for adding phosphoric acid after equalization of flow and ahead of aeration. When lime is needed, it is added directly to the aeration tanks. The denitrification problem was solved by maintaining the dissolved oxygen level in the aeration tanks between 0.2 and 1.0 mg/L and by recycling return sludge at a high rate.

"Orlon Manufacturing Wastes Treatment." By E. F. Taylor, F. T.



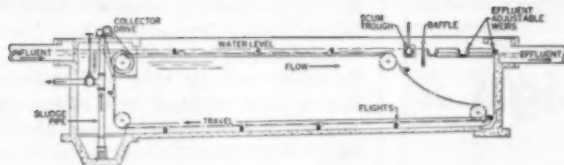
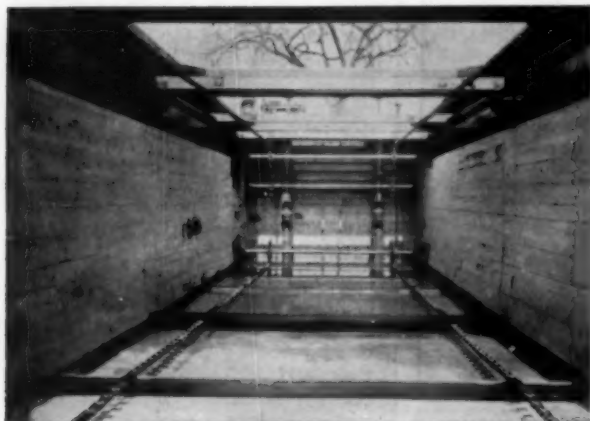
● FLOW diagram of treatment plant for Orlon wastes. The acrylonitrile recovery column tailwaters contain the bulk of the BOD and require cooling before treatment.

Courtesy Journal WPCF

WHICH SLUDGE COLLECTOR

can do the best job for you?

For maximum efficiency . . .
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choose **LINK-BELT**
STRAIGHTLINE sludge collectors

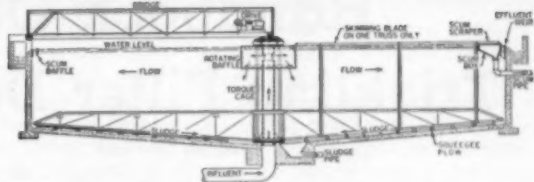


STRAIGHTLINE COLLECTORS are scraper conveyors made in various styles to handle sludge and scum in *rectangular tanks*. Straightline design means the shortest possible travel for the collected material. It also permits a steady slow speed of the collecting flights that is uniform over the entire floor surface of the tank. This results in maximum efficiency with minimum disturbance to the flow. Straightline collectors can also be installed in the Link-Belt Uniflow settling tank—an improved rectangular design combining a rapidly sloping bottom with a system of multiple effluent weirs.

Send for Straightline Sludge
Collector Book 2746 and
Uniflow Settling Tank Book 2648



For large installations
where construction economies
are vital . . . it's **LINK-BELT**
CIRCULINE sludge collectors



CIRCULINE COLLECTORS are installed in either rectangular or round tanks. Link-Belt offers four series—R, S, T and C. Series R are usually installed in circular tanks and are used to remove settled sludge from the tank floor and scum from surface of liquid. Series S are for square tanks, or rectangular tanks where sludge is collected only from the influent end of tank. Series T are similar to Series R, except they are built to withstand torques encountered in removing heavy settled solids. Series C have both the economical feature of circular tank construction and the positive sludge and scum collection of a straightline sludge collector.

Send for Circuline Sludge
Collector Book 2546



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Bodurtha, Jr., R. F. Rocheleau and G. C. Gross, E. I. du Pont de Nemours and Co. *Journal WPCF*, October, 1961.

Joint Disposal of Sewage and Sulfite Wastes

Following the construction of the Watts Bar dam on the Clinch River, the City of Harriman, Tenn., was faced with the problem of pollution of its water supply by its own sewage treatment plant effluent and neutral sulfite wastes from the Mead Corp. Both of these waste sources are downstream on the Emory River from the Harriman raw water intake. The impoundment produced by the Watts Bar dam backed up the lower part of the river which is tributary to the Clinch River, and the resulting density currents carried the wastes upstream. Moving the intake was impossible; consequently a system of lift stations and interceptors was devised to divert the wastes to another watershed, the main channel of the Tennessee River, 7 miles from Harriman. The domestic waste is collected by four small lift stations and pumped across the Emory River where they are treated by primary sedimentation and chlorination. The plant effluent is mixed with the sulfite wastes and is pumped about 5,000 ft. to another lift station. Here it is discharged into a 24,000-ft. force main to a surge chamber, and thence flows by gravity to the Tennessee River. Odor control was necessary at the surge chamber, involving addition of lime to each waste separately. The project was financed jointly by the city and the Mead Corp.

"A Unique Disposal System for Combined Wastes at Harriman, Tennessee." By J. R. Fleming, Director, Division of Sanitary Engineering, Tennessee State Department of Public Health. *Journal WPCF*, October, 1961.

POSITION AVAILABLE

Natural Resources Coordinator

Fresno County, Calif., is seeking a man experienced in developing and administering a natural resources program. Requirements include 6 years of professional engineering experience or experience in a conservation program involving considerable public contact. Salary \$831 to \$1038. Apply Director of Personnel, 101 Hall of Records, Fresno 21, Calif.

The Disposal of

Dead Marine Mammals

JOE CREISLER, M.P.H., R.S.

Sanitarian,
Del Norte Co., Calif.

The material in this article is condensed from a longer article in California Vector Views.

THE Del Norte County, Calif., Health Department is responsible for the disposal of dead marine mammals. Money for this activity is provided in the Emergency Garbage Disposal Fund which is part of the Garbage Disposal Budget administered by the department. An average of twenty carcasses a year must be disposed of at County expense. Where it is practical and safe, the carcasses are blown up with dynamite. When a carcass is lodged in heavy driftwood, washed ashore among rocks or located where dynamiting would be extremely hazardous, an alternate disposal method is used. It consists of covering the carcass with hot lime or chloride of lime which serves the added purposes of reducing odor and fly production. It has been our experience that dynamiting of the carcasses is the quickest and most sanitary method of disposal. This is based upon the fact that if a carcass is literally blown to shreds, it is not long before the tides and scavenger birds clean up the resulting debris.

When such occasion arises, the Health Department hires a powder man who understands the work since the blowing up of a soft mushy carcass is quite different from stump blasting and other conventional uses of explosives. The cost to the County is \$15 per sea lion. This includes labor and supplies. If there are several dead sea lions to be disposed of, a flat rate of \$10 per animal applies. The expenses incurred for the disposal of whales depends upon the amount of dynamite needed (about 150 pounds of dynamite was used to dispose of a 40-foot gray whale), rental of equipment to move supplies, personnel time and other miscellaneous costs.

The following technique used for the dynamiting of carcasses was developed by Gordon Linville of Crescent City, Calif.

1) A shallow trench is dug on the landward side of the carcass if it

lies parallel with the shore. The trench is dug all around the carcass if it lies at right angles to the shoreline.

2) A liberal amount of 50 percent dynamite is placed in the trench, slightly under the carcass with individual sticks of dynamite placed in the middle. Usually 10 to 15 sticks are required for small to medium sized animals. Additional dynamite is used for larger carcasses. For carcasses that lie at right angle to the shoreline, sticks of dynamite are placed all around with a heavy shot placed in the end of the trench nearest the beach.

3) The dynamite cap is then placed; the fuse setting time, usually two to three minutes, is determined; the trench is then covered

and packed with wet beach sand up to the ridge of the carcass.

4) Before the charge is detonated, arrangements are made to have a deputy sheriff present to keep people and cars at a safe distance from the blast area.

The primary aim in this type of disposal is to blow the shredded carcass into the water, if possible on an incoming tide. One of the hazards in blowing up sea lions is the backward thrust of the flippers from the blast. For whales primer cord is used to get the entire charge to fire at once. This blasting method of disposing of dead marine mammals is the best way we have found to handle the problem. For instance, through its use we have disposed of nine dead sea lions in one morning. Attempts to burn or to bury carcasses by the use of heavy equipment are too time consuming, too expensive and only partially successful. Of course, location of the carcass may dictate the method of disposal used in each instance.

How to Roll Out a Carpet of Grass

SCIENTIFICALLY conceived factory-produced grass has proved successful. Troy Turf now offers a choice of 13 grass varieties in an inexpensive, easy to install roll. In addition, a new method of installation has been developed which produced lush grass at savings in costs and time of more than 50 percent over conventional methods.

Problem areas such as gullies, ravines, hard or clayey soil and steep slopes can now have grass in a few weeks and without the bother of extensive soil preparation. Fer-

tilization is completely unnecessary during the growing period. Thus the mat is a scientifically planned layer structure combining seed, a complete fertilizer, soil conditioner, organic matter and pH control. The growth promoting ingredients and seed are mechanically secured with a layer of jute mulch. The mat is so strong that it prevents erosion of even 85 degree slopes yet permits unhampered passage of germinating seed. This anti-erosion factor as well as Troy Turf's resistance to wind and rain, make it possible for the installation of grass in areas where it has been impossible to grow grass before.

The Troy Turf can be installed at tractor speed by the use of a new machine—the Troy-trac. The mat roll is threaded through a spiked roller and then virtually stapled to the ground as the roll unwinds. Very little soil preparation is necessary.

Another important feature of Troy Turf is its shelvability. Unlike sod, Troy Turf can be stored for as long as nine months before being laid. And since it comes in rolls it requires a minimum of warehousing space. A 10 x 10 ft. area can hold 100 rolls, the equivalent of one acre. Standard rolls are 90 feet long by 54 inches wide but it can be cut to specified widths.



● INSTALLING a roll of Troy Turf at the rate of 1000 feet in 5 mins.

Hydro E-Z Packs save 4 hours per man per day!



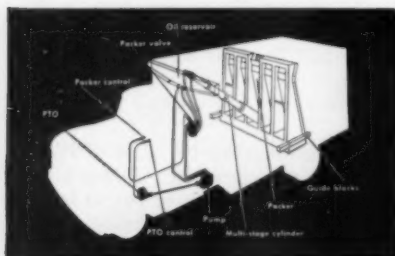
"Eight E-Z Packs handle the load 64 dump trucks carried"—



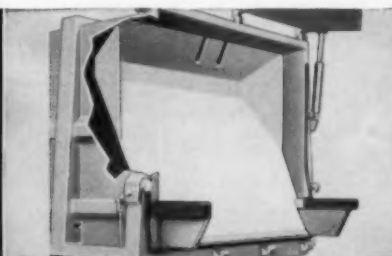
MR. C. E. COULTER
Peoria Disposal Co.

In Peoria, Ill., the Peoria Disposal Co. makes money with a fleet of 8 Hydro E-Z Packs against tough competition. Loads baled under 76,600 lbs. pressure in the world's most powerful refuse compactor average 5 to 8 tons compared with only about 1200 lbs. carried in the company's old non-compacting bodies. Company President

C. Elmer Coulter reports that 8 Hydro E-Z Packs handle 4 times the load 16 dump trucks carried—and save 4 hours a man a day formerly lost on extra trips to the landfill! But see for yourself. See your Hydro E-Z Pack distributor or write us. We'll help arrange a demonstration and send you a free copy of "The Big Squeeze."



Simplest of all disposal bodies with the fewest working parts. No complicated chains, conveyors or whirling knives.



Bulldozer plow travels length of floor for compaction, beyond body for clean unloading of bale. No hoisting needed.



Lower cost with less depreciation since elimination of heavy and complicated mechanism decreases chassis requirements.



HYDRO E-Z PACK®

HYDRO E-Z PACK DIVISION OF HERCULES GALION PRODUCTS, INC., GALION, OHIO—U.S.A.

Significance of Detergents

(Continued from page 95)

It has been found that water depth is an important consideration in the study of frothing tendencies. The concentration of ABS needed to produce a given height of froth decreased markedly as water depth increased, according to Sawyer (7).

The use of anti-foam agents in sewage reportedly has a further depressing effect on oxygen transfer rates. Such agents have been increasingly used in some areas.

One of the most promising approaches to obtain more effective removal of ABS in waste treatment works has been outlined by McGauhey and Klein (11). They have suggested continuous removal of ABS by deliberately frothing the effluent of a waste treatment unit. The froth would then be skimmed off and disposed of separately. Because of the tendency of ABS to concentrate in the froth, froth-producing agents would be deliberately added in this method. Total ABS removals, when this step was added to the regular treatment process, which in this study was activated sludge, resulted in an over-all removal of 82 to 93 percent of an initial concentration of ten mg/L of ABS in the raw sewage. McGauhey and Klein further suggested that the froth thus stripped from the surface of the basin could be destroyed by burning it with waste digester gas. This interesting proposal is being given further study.

The process known as "foam fractionation" used particularly in the petroleum industry is said to be applicable to the ABS removal problem. One proposal for using foam

fractionation at activated sludge plants is similar to the method studied by McGauhey and Klein (26).

Treatment of laundromat wastes containing large amounts of synthetic detergents has been discussed in detail in one report (9). Three methods of treatment were considered. The first involved a diatomaceous earth filter; the second a floatation process including pH reduction and alum flocculation in the presence of rising air bubbles; and the third a batch treatment process using activated carbon and alum. The report stated that individually or collectively the treatment methods appeared capable of the following: 1) Removal of 85 to 95% of suspended solids; 2) removal of 90 to 95% of the BOD; 3) removal of 80 to 95% of the synthetic detergents.

ABS in Streams

Table 1 shows the ABS content of some United States surface waters. Hurwitz, et al, (8) found only 37 percent ABS removal in the Illinois River over a distance of 114 miles, during about eight days travel time. The principal contributor of ABS was the Metropolitan Sanitary District of Greater Chicago. The ABS content of the raw sewage was about 3.4 mg/L and approximately 1.6 mg/L in the effluent. Previous studies, conducted at the U. of Illinois (16), indicated that the ABS concentration of sewage effluent is approximately two to five mg/L and that ABS concentrations in streams receiving sewage discharge are generally less than one mg/L.

Laboratory studies have confirmed another point indicated by stream surveys—that the complex

phosphates degrade to the simple ortho form in the presence of stream biota, but at rates varying with the physical, chemical and biological conditions present. The U. of Illinois studies showed that condensed phosphate concentrations were generally less than 0.1 mg/L (P_2O_5) in lakes and reservoirs, and generally less than 0.5 mg/L (P_2O_5) in lakes and streams receiving significant domestic sewage. The study also showed that about one half of stream phosphates came from land drainage. In highly polluted Illinois streams the levels of phosphate and ABS concentrations were about the same as those in domestic sewage effluents. The complex condensed phosphate content ranged from 10 to 20 mg/L, ortho phosphates one to two mg/L, and ABS two to five mg/L.

In Water Treatment

The most important builder compounds of present day commercial synthetic detergents are the condensed phosphates, sodium tripolyphosphate (STP) and tetrasodium pyrophosphate (TSPP). Morgan and Engelbrecht (17) reported that condensed phosphates at relatively high concentrations are capable of producing moderate interference with coagulation and sedimentation of hard, turbid waters under conditions of continuous flow through a pilot treatment plant. Condensed phosphate levels studied ranged from 0.5 to 2 mg/L.

The removal of ABS in water treatment plants does not appear to be practical. Various treatment materials including chlorine dioxide, aluminum sulfate, ferrous sulfate, settled sediment, precipitated calcium carbonate and clay have been investigated with limited success (2). Activated carbon has been found to be effective, but high dosages are required. Figure 2 shows that for an ABS content of 2 mg/L an activated carbon dosage of 50 mg/L reduced the ABS to 0.52 mg/L, giving an over-all reduction of about 75 percent.

Taste or odors in treated water have been attributed at times to ABS present, but because they may not be specific, they could reflect the presence of the other substances associated with different contaminants which may have entered the raw water supply.

Ground Water Pollution

Minnesota Experience. In November of 1960, Woodward and associates (19) reported on a comprehensive study of ground water con-

Table 1—ABS Content of Some United States Surface Waters

(Reference 2, 15)

Water Source and Sampling Location	Sampling Date	Apparent ABS Concentration, mg/L
Illinois River	1959	0.5 — 1.3
Marais des Cygnes River, Kansas	1953	0.08 — 1.3
	1954	0.08 — 1.4
Mississippi River	1959	0.02 — 0.04
Missouri River	1959	0.01 — 0.04
Neosho River, Kansas	1953	0.14 — 0.24
	1954	0.5 — 1.7
	1957	0.4 — 1.8
Ohio River	1955	0.06 — 0.15
Schuylkill River, Pennsylvania	1959	0.04 — 0.08
Lake Erie	1959	0.00 — 0.04
Clinton River, Michigan	1960	0.5 — 0.6
Raisin River, Michigan	1960	0.0 — 0.2
Rouge River, Michigan	1960	0.0 — 0.2
Cass River, Michigan	1960	0.0 — 0.1

tamination in unsewered areas of Minnesota. By September 1, 1960 they had studied approximately 63,000 private wells, serving about 60 percent of the 400,000 people dependent on private wells within 39 communities around the Minneapolis-St. Paul area. Thirty thousand of these well waters showed the presence of nitrates or surfactants of sewage origin. Of this group 10.6 percent had nitrate nitrogen contents of 10 mg/L or more, and 21.8 percent of the well waters had measurable amounts of surfactants.

Among the younger communities, 10 to 20 percent of the wells most

seriously affected by sewage also showed coliform bacterial contamination. In older communities, those wells most seriously affected by sewage had bacterial contamination in 50 percent of the wells.

The study brought out certain factors important in influencing ground water pollution and listed them as follows: Well depth; population density; character of soil; time, direction and speed of ground water movement.

In commenting on the study, the authors said, "In view of the wide range of geological conditions involved in ground water contamina-

tion in Minnesota, there is every reason to presume that throughout the nation, and for that matter throughout the world, where developed communities are served by individual water supplies and individual sewage disposal systems of the soil absorption type, contamination of the ground water may be anticipated in a relatively short period of time."

The significance of nitrates and surfactants in ground water as indices of contamination is important. Nitrates in the concentration found in the Minnesota Study are not believed capable of producing undesirable physiological effects in anyone other than a bottle-fed infant. Moreover, the peak surfactant concentration found there is not toxic, as far as can be determined now. However, other organic and inorganic chemicals which are soluble constituents of sewage, may also find their way into the ground water. Thus, there is no way of knowing when a quantity of toxic chemical material may reach a well, nor is there any satisfactory way of determining the long-range effects of ingesting small amounts of such chemicals. The appearance of coliform organisms in up to 50 percent of the well supplies in older communities indicates a bacterial breakthrough as a result of the massive loading of the ground with sewage. With the occurrence of such a breakthrough, a question naturally arises as to whether or not pathogens of a virus nature may not also be found in such waters in sufficient number to produce infection.

New England Study. This study (20) found that anionic detergent pollution of ground water travelled 800 feet from a stream to a well. The authors believe the detergent pollution tends to travel a ribbon rather than expanding laterally, with little dispersion.

New York Experience. A study conducted in Suffolk County, New York found that 35 percent of 600 wells investigated contained ABS. It was then speculated that there were, or soon would be 17,000 ABS-contaminated wells in Suffolk County (15). In Copiague, New York, 60 of 186 wells examined had ABS contents which varied from 0.1 to 2.5 mg/L. Deep wells showed less contamination than shallow wells, indicating the protection afforded by earth strata.

In recognition of the seriousness of ground water pollution by syndets in New York State, FFA has revised upwards its requirements in that state on minimum lot size and



Roll-call for water



When Wall Street, N.Y. Was Only a Stone Wall

After the Dutch bought Manhattan Island from the Iroquois Indians, they built a stone wall across the island to prevent possible attack by the English. That military barrier, built 308 years ago, is known today as Wall Street and is the financial center of the United States. Around it stands one of the largest cities in the world!

What a change has taken place in 300 years! This one time wilderness—now three Middle Atlantic States—has become one of the most heavily populated and one of the wealthiest sections of the country. It has great factories and industries, educational institutions, famous pleasure resorts, rich agricultural districts, modern hospitals. It has 85 domestic water distribution systems, each serving 25,000 or more consumers. Some of them are the largest and most modern water works systems in the Nation. But—authorities rate only 40 of them as adequate, 25 as of doubtful adequacy and 20 of them as deficient in capacity!

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for sanitary facilities. New requirements are more stringent and are intended to provide greater protection against this and other types of pollution entering the ground water (21).

FHA Study. Kiser, in a study of six communities having 131 wells, located in a widely scattered area from Minnesota to Florida and Virginia to New Mexico, found 10 percent of the well waters contained ABS concentrations which varied from 0.4 to 4.1 mg/L (15).

Lagoons. In Plainsville, Connecticut, 42 pounds of anionic surfactants which had been discharged to a lagoon traveled 500 feet and polluted a ten inch water well during a period of six to seven months. At Kearney, Nebraska (15), sewage pollution from a lagoon traveled three-fourths of a mile in fourteen months and appeared in an irrigation well which had a surfactant content of 0.3 mg/L. Another well, 800 feet away, had a 2.0 mg/L surfactant content. A domestic well a thousand feet away had an ABS of 1.5 mg/L. In Peoria, Illinois, the water in a recharge pit along the Illinois River had an ABS content of 0.7 mg/L. A test well 200 feet away had an ABS content of 0.7 mg/L, and an industrial well 1,800 feet away contained 0.17 mg/L.

On Public Health

In toxicology, the term LD_{50} is defined as the amount of substance (usually expressed in grams, milligrams or milliliters) per unit of body weight, which, on the average, will kill one-half of a group of animals of a given species under given conditions. The oral LD_{50} for ABS, depending on the species of animal, is variously reported to be in the range of 1.0–2.3 grams per kilogram of body weight (22).

Freeman and co-workers (22) fed purified alkyl aryl sulfonate to six men at a rate of 100 milligrams per day for four months, or the equivalent of two liters of water per day containing 50 mg/L of ABS. The men experienced no change in weight and only two reported any effect on their appetites. The same investigators fed ABS to dogs at a rate of one gram per day for six months and to rats as 0.5 percent of their diet for 65 days. Dosages as high as these produced no changes in weight, in the blood or in other tissues of the animals. Woodard and Calvery (22) gave ABS to guinea pigs at a 0.2 percent concentration (2,000 mg/L) in drinking water for six months. The animals did not exhibit toxic symptoms.

Toxic studies with swine are particularly relevant because of the similarity of this animal's digestive system to that of man. Metabolic studies with swine have shown that 99.5 percent of an orally administered dose of S_{35} -labeled ABS was excreted within eight days after injection, more than half of it appearing in the feces. Most of the ABS was excreted unchanged. The solubility of ABS is such that efficient excretion apparently does not require that it be metabolized. There have been various reports of growth-promoting effects of ABS in poultry rations. Lehman, of the Food and Drug Administration, has stated that because of their low toxicity, anionic agents offer "no cause for alarm," but that long term studies up to that time were inadequate to establish their safety as additives in food stuffs.

The British government committee on synthetic detergents has concluded that there is no evidence pointing to any serious acute toxic effects from anionic (or non-ionic) detergents.

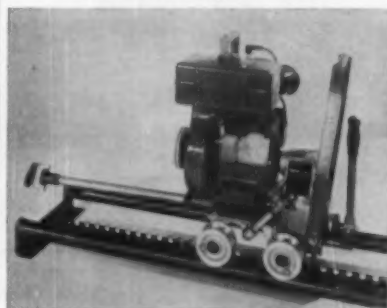
The Public Health Service Drinking Water Standards (23) recently adopted contains a recommendation of a limit of 0.5 mg/L for ABS. This has been justified on the basis that beyond this level, drinking water so contaminated may exhibit undesirable foaming. Such a concentration is also considered to indicate that at least five percent of the water is of sewage origin.

Experience Elsewhere

Livingston (24) has reported that a new anionic type of detergent was tested in England under laboratory conditions. About 90 percent removal of this detergent was obtained by activated sludge treatment as compared to 68 percent removal of the type now marketed there. The amount of foam produced by the effluent from the treatment of the new detergent was no greater than that from treatment of sewage which contained no detergents. Spargo (25) reported the content of anionic synthetic detergents in the raw sewage and effluent of various treatment units of the Johannesburg treatment works. The concentration in the raw sewage was 4.6 mg/L. Approximately five percent was removed by sedimentation and approximately 50 percent of the remainder by biological filtration. The activated sludge process removed 66 percent of the synthetic detergent entering the unit. Reportedly the receiving stream

(Please turn to page 158)

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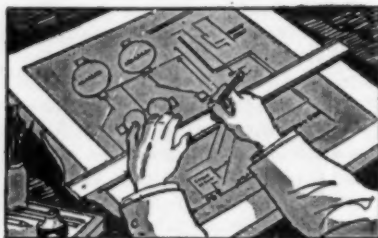
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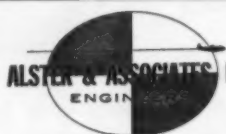
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showed appreciable pollution by synthetic detergents.

Conclusions

1) Present levels of ABS in surface waters of the United States have varied widely, sometimes reaching or even exceeding 1.0 mg/L but usually being much less than this figure.

2) The ABS content of raw domestic sewage has ranged from one to ten mg/L.

3) Conventional sewage treatment has achieved two to four percent ABS removal by primary sedimentation and over 50 percent removal by primary plus secondary treatment. Higher removal rates appear possible by methods now under study.

4) Because of the inherent characteristics of synthetic detergents, they reduce oxygen transfer rates and thus affect biological waste degradation, both in conventional waste treatment and in receiving waters. Sedimentation effectiveness also may be slightly reduced. However, the over-all effects on treatment have not been regarded as significant, except in unusual cases.

5) Foaming is not only aesthetically objectionable, but can also reduce surface reaeration.

6) Present levels of builder compounds have not caused serious difficulties in water treatment. Tastes and odors attributed to the presence of ABS sometimes may be caused by other contaminants.

7) Ground water pollution, as evidenced by ABS intrusion into private well supplies, is becoming a serious problem in many metropolitan areas.

8) Present levels of ABS in drinking water are not regarded to be serious from a public health standpoint, according to toxicological studies. Long-range effects are yet to be evaluated. □□□

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EQUIPMENT NEWS

Comfort Stations



Comfort stations made of vandal-proof materials and featuring unbreakable cast aluminum plumbing fixtures are available prefabricated for on-the-site erection. Constructed of heavy gauge steel or aluminum walls, a channel supported roof deck, and installed on a concrete slab floor, the locked central storage area contains all piping; including a hose bib to provide easy hosing or washing of the entire station. The modular construction enables complete design flexibility to meet individual site and traffic re-

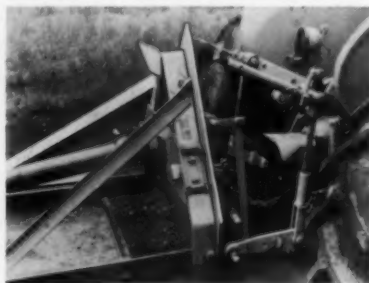
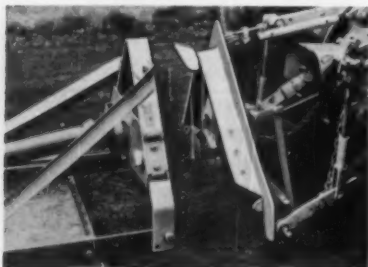
quirements. Any number of water closets, urinals, lavatories or shower units can be installed by simply enlarging or reducing the overall building size. Additional features include maximum ventilation, off-the-floor plumbing fixtures, vandal-proof bolts, screws, flushing valves, mirrors, paper-holders and clothes hangers.

Aluminum Plumbing Fixture Corp., 778 Burlway Road, Burlingame, Calif.

Circle No. 12-1 on the convenient reply card facing page 34.

Tractor Hitch

The automatic Insta-Hitch is a device offering tractor operators a means of coupling onto equipment without leaving the tractor seat. No second man is needed. The system is designed for rear-end three-point and tongued equipment as well as every type of attachment or tool used with the front-end loader-arm. The design principle is



two triangular frames, one nesting inside the other. The outer frame is attached to the various equipments to be used, the inner frame is attached to the tractor. An automatic PTO connection is an optional item. The units are being distributed nationally by International Harvester.

Insta-Hitch Division, Powell Pressed Steel Co., Hubbard, Ohio.

Circle No. 12-2 on the convenient reply card facing page 34.

Flasher Tester

A portable instrument to measure flash durations of the usual 6-volt or 12-volt incandescent flasher, the Duratest is a self-contained, hand-held instrument of complete portability. The system employs a transistorized circuit which measures the cumulative charge of a capacitor. The highway inspector can promptly and accurately check the flash duration of any incandescent flasher within the range of the instrument, with an accuracy of about 5%. The Duratest functions to measure the time of current flow through the filament of a lamp and registers in milliseconds on the meter scale. A nomogram is provided from which the percent duty cycle is read.

Northern Signal Co., Inc., Saukville, Wisconsin.

Circle No. 12-3 on the convenient reply card facing page 34.

Turf Mower

The Mott B-32 hammer-knife mower, with a 6 hp Wisconsin engine, has a full 32" cut and the maneuverability of a small mower. The quickly attached sulky and foot rest permit the operator to walk or ride. Two forward speeds and one reverse permit travel up to 2.5 mph. The 88 light weight spring steel knives require no setting and can be replaced individually. Height control shoe, adjustable from $\frac{3}{4}$ " to 3", prevents scalping.

Mott Corporation, 500 Shawmut Ave., LaGrange, Illinois.

Circle No. 12-4 on the convenient reply card facing page 34.



Traffic Camera



A portable, unattended roadside radar-camera that automatically monitors traffic speed and flow, this unit provides individual photographs of each vehicle, showing direction, identification, coloring, approximate number of occupants, lateral road position, specific maneuver in relationship with other vehicles, time, date, location, degree of illumination and weather conditions. Known as the Borkenstein Radar Traffic Camera, the unit is disguised as a double roadside mailbox. A completely transistorized radar reads speeds up to 100 mph. The electrically-operated camera uses standard 35 mm. roll film and requires no focusing. One hundred feet of film will record a minimum of 1600 pictures, $\frac{3}{4}$ " x 1". A pneumatic tube or photo cell is used for triggering. Any standard automobile 12-volt storage battery will operate days without recharging.

Instrument Division Rex Metal Craft, Inc., 1717 Gent Avenue, Indianapolis 2, Ind.

Circle No. 12-5 on the convenient reply card facing page 34.

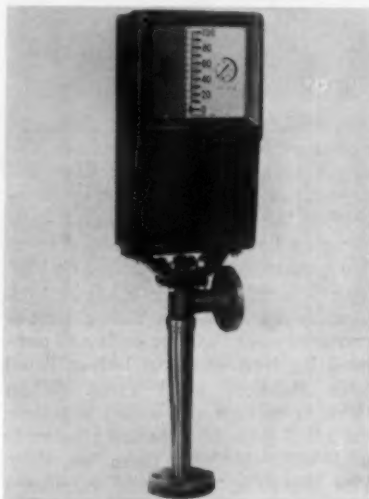
Transmitter

The Pneumatic Varea - meter transmitter has a powerful servo system, plug-in components and other unique design features. It is designed specifically for use with W&T metal-tube and glass-tube Varea-meters. The float-position sensing device is positioned over the entire float travel by a pneumatic servo system. The sensing device follows the slightest movement of the float rod without producing drag. It will respond to a change in float position of only 0.07% of full scale. With plug-in construction of all major components, the sensor, pilot

valve assembly and the actuator can be removed and replaced with standby units in a few minutes. The Varea-meter Transmitter can be used with any indicator, recorder, integrator or controller which will accept a standard 3 to 15 psi signal.

Wallace & Tiernan Inc., 25 Main St., Belleville 9, N.J.

Circle No. 12-6 on the convenient reply card facing page 34.



Ditch Filler



A ditch can be filled with one pass of a tractor with an Imco Ditch Filler attachment. Six heat-treated scarifier shanks, with replaceable points break up the dirt and take side drafts. The shanks are adjustable so they can be used for scarifying only, if desired. This attachment has two 15-inch high moldboards properly curved and pitched to roll the dirt into the trench.

Independent Mfg. Company, Inc., Neodesha, Kansas.

Circle No. 12-7 on the convenient reply card facing page 34.

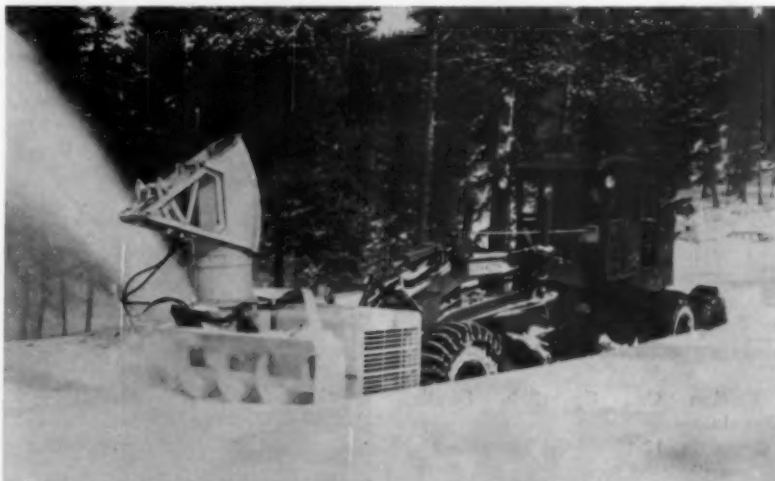
Rotary Snow Plow

This rotary type snow plow attachment can be mounted on Austin-Western graders and put into use within 30 minutes to move 20 to 25 tons of snow per minute. The Sicard unit will operate successfully at elevations as high as 12,000 feet and in snow as deep as 5 feet. Snow can be cast as far as 175 feet. Powered by its own self-contained, 222 horsepower UD-549 International V-8 gasoline engine, the plow is designed for mounting on the front

end of A-W standard all-wheel drive and steer, torque converter machines of 21,000-pound class and larger. Control of the unit is completely hydraulic, from the operator's cab on the grader. Cutting width of the rotary blade unit is 8½ feet.

Austin - Western Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Aurora, Ill.

Circle No. 12-8 on the convenient reply card facing page 34.



Backhoe Bucket

A variable pitch backhoe bucket that can be varied in a 103° arc by a hydraulic switch located on a control lever is offered as optional equipment for the Insley Model K, L and M backhoes. It features a hydraulic cylinder mounted on the hoe arm, which changes the bucket pitch. Under-cut work can be accomplished much more effectively with the variable pitch bucket because the bucket can be rotated under pipe from the far side. The pitch of the bucket can be set so that the teeth will dig perpendicularly from the near side of the pipe. The bucket offers several other advantages. Level floor digging range is greater than with a fixed pitch bucket. Basement digging can be handled with less hand trimming.

Insley Manufacturing Corp., P.O. Box 167, Indianapolis 6, Ind.

Circle No. 12-9 on the convenient reply card facing page 34.



Grade Indicator

A grade indicator, the Grade-O-Meter, is mounted on motor grader, bulldozer, scraper, or other equipment. A glance at the 9-inch dial tells the operator the slope or grade being cut. Deviations from the horizontal are magnified eight times by the dial indicator. The dial is scaled to give four simultaneous readings: The slope expressed in percentage, the slope expressed as a ratio (12 to 1, 4 to 1, etc.) and the crown slope on each half of a 24-foot or 32-foot roadway.

Fredon Co., Spearfish, South Dakota.

Circle No. 12-10 on the convenient reply card facing page 34.

Pipe Coupling



A method of connecting plain-end pipe and fittings in sizes from one to six inches reduces the time and expense of pipe installation by eliminating the need for threading, beveling or flanging pipe ends. Key to the system is a Hycar gasket molded by General Rubber Corporation, Tenafly, New Jersey. This gasket is centered over the pipe ends and covered by iron coupling halves fitted with stainless steel grips. When these couplings are bolted together, the steel grips engage the pipe ends and securely lock them together. The Victaulic "Plainlock" couplings are easy to position and are recommended for general services including water, air, gasoline and most petroleum services at temperatures up to 180 degrees F.

Victaulic Company of America, Elizabeth, New Jersey.

Circle No. 12-11 on the convenient reply card facing page 34.

Coil Delineator

The flexible, vandal-resistant, reflective coil of aluminum can be cut to any length and fastened to wood guard rail posts or utility poles to make them brightly visible in headlights at night. "Scotchlite" reflective delineator coil is a continuous 3-by-900-inch strip of silverwhite reflective sheeting laminated to a coil of .019-inch aluminum. It can be pulled from the dis-



penser-box and cut to any length with heavy scissors or tin snips. It is simply wrapped around each wood post and nailed or stapled in place. ReflectORIZATION of concrete pillars or bridge ends can be accomplished with a stainless steel strap clinching ends of the coil.

Minnesota Mining and Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.

Circle No. 12-12 on the convenient reply card facing page 34.

Aerial Beam

This development of a small hydraulic aerial beam enables one man to reach easily over parked and moving cars and between telephone and power lines. Some typical uses include work on mid-span cable, insulator inspection, transformer re-fusing, maintenance and



installation of cables, street lights and signs. The Spirex outer beam and molded fiberglass basket are insulated to provide ample protection from high voltage lines. Hydraulic remote controls for operating the outer and inner beams are located beside the basket and on the mast. All movement is powered by a heavy-duty pump driven by a power take-off on the truck transmission. Three sizes are available for mounting on light-duty vehicles of up to 1½ tons.

McCabe-Powers Body Co., 5900 North Broadway, St. Louis 15, Mo.

Circle No. 12-13 on the convenient reply card facing page 34.

Traction System

Immediate traction in snow, ice or mud without jacking up or moving the vehicle is available with the Tractioneer dual tire system. In a matter of minutes the driver can install the dual tire units with a socket or lug wrench. At normal speeds, the unit is designed to give vibration-free running on or off the road. Specially formed spring steel plates fit over the dual tires and are bolted to a connector which is permanently installed in the wheel spacer. Where necessary, six or more units can be installed per dual wheel. Removing the units requires only disengaging the connector bolts. The units are available for both spoke and disc type wheels.

The Tractioneer Co., 460 Wrigley Bldg., 410 N. Michigan Ave., Chicago 11, Ill.

Circle No. 12-14 on the convenient reply card facing page 34.



Resurfacing

Laykold heavy-duty resurfacer provides a thin surface that is tough, skid-resistant, and will withstand vehicular traffic. Recommended for garage decks and similar applications over hairline cracks; for rough concrete surfaces; and to provide a water barrier on concrete structures. Resurfacer is easily applied, without heating, by squeegee or troweling. Final smoothing is by metal float. Recommended rate of application is 1.25 gal./sq. yd. Drying time, on a clear summer day with ample circulation of air, is said to be about 4 to 5 hours.

American Bitumuls & Asphalt Co., 320 Market St., San Francisco 20, Calif.

Circle No. 12-15 on the convenient reply card facing page 34.

Metal Buildings



A line of pre-engineered small all-metal buildings, designed for quick field assembly, which are applicable as field offices; garages for trucks and maintenance vehicles; field warehouses for storage of equipment, construction supplies and inflammable materials; and as low cost portable buildings to house power equipment. Through the use of color on exterior wall panels, these buildings are suited for con-

struction near modern commercial or residential areas. The self-supporting structures are available in clear span widths from 4 feet to 32 feet and in heights from 7 to 14 feet with gable roof systems. They can be constructed to any length with the addition of 16-inch panels.

Parkersburg Building Division, Parkersburg, West Virginia.

Circle No. 12-16 on the convenient reply card facing page 34.

Electric Welders

A protected control panel is a feature of this line of dc motor generator arc welders. In the design, meters and controls are protected by a visor which extends out over the entire control panel. All models have multi-range dual control, with 10 main ranges of welding current and 100 steps of volt-ampere adjustment in each range. Other controls include remote control, polarity switch and motor start-stop-reset buttons. Meters and portable mounting are optional

equipment. Rated at 60% duty cycle, 200, 300 and 400 ampere models are available for either 50 or 60-cycle operation.

Hobart Brothers Co., Troy, Ohio.

Circle No. 12-17 on the convenient reply card facing page 34.

Light Control

This automatic, on-at-dusk; off-at-dawn, plug-in street light control design provides for screw-driver adjustment of the operating light level desired in the field, without removing the control from its receptacle. Other features of the dialatrol include varistor surge-protection for the hermetically-sealed photoconductive cell, a 1500-watt rating with incandescent lamp loads, elimination of capacitors and rectifiers from the circuit, lightning arrestor, and aluminum case designed to resist impact of hail.

Lightguard Electronic Mfg. Co., Inc., 1213 St. Emanuel St., Houston 3, Texas.

Circle No. 12-18 on the convenient reply card facing page 34.



Spreader Trailer

The Calhoun Speed-Spread spreads sand, cinders, chips, salt and calcium chloride 36 to 40 feet wide on streets, highways, park roads and parking lots. The spreading pattern may be widened or narrowed by regulating the speed of the 18" diameter spreader fan. It operates from the power takeoff of a tractor but Calhoun offers a gasoline engine to drive the distributor fan as optional equipment when PTO is not used. The heavy gauge



steel hopper, 54" x 72", has 1 ton capacity for 60-pound material.

Calhoun Manufacturing Co., Inc., Cedar Falls, Iowa.

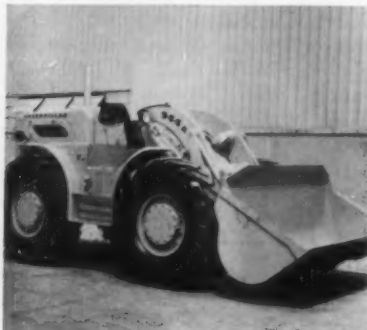
Circle No. 12-19 on the convenient reply card facing page 34.

Material Buckets

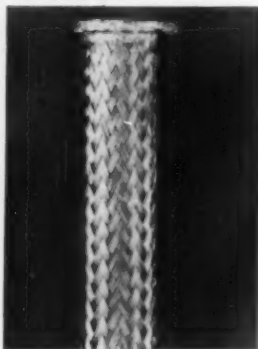
Nine general application buckets (three types for each of three models) are now available for Cat wheel-type loaders, raising to 15 the number of buckets now offered for the 966, 944 and 922 loaders. These buckets incorporate extended cutting edges which are induction hardened and self-sharpening. The five types of buckets are: 1) standard; 2) light material; 3) reduced capacity; 4) narrow width; and 5) standard width, increased capacity.

Caterpillar Tractor Co., Peoria, Illinois.

Circle No. 12-20 on the convenient reply card facing page 34.



Water Filter



A different concept in septum design for diatomite and similar filters for solids removal in water treatment is embodied in the "Flex-tube" filter. The septum elements are constructed of stainless steel braided wire. As such, they are flexible and susceptible to elongation and contraction with pressure changes. This simplifies clearing the tube surface of diatomite at the end of a filter run reducing "down" time and minimizing clogging. The Flex-tube filter is marketed as a complete pressure filter unit in various sizes, 10 sq. ft. and larger. Tests with tap water containing 50mg/L clay indicated flows of 1.6 to 2.0 gpm per sq. ft. are feasible. The flowrate applicable, however, depends on the concentration and type of suspended matter to be removed.

Filtomor, Inc., 460 Bloomfield Ave., Montclair, N.J.

Circle No. 12-21 on the convenient reply card facing page 34.

Safety Control Float Valve

Protection for all engines against damage from sudden or gradual loss of engine coolant is now available through the use of this liquid level sensing device. Installed at any convenient spot in the cooling system, the float mechanism activates shut-down or alarm devices at the first sign of trouble. Although it has wide application, the new liquid level unit was specifically designed at the request of operators of off-the-road equipment who were experiencing expensive down time and repairs. Completely non-electric, weather proof and fail safe, the Calcon safety controls offer constant monitoring of engine.

California Controls Company, 1525 Powell St., Oakland 8, Calif.

Circle No. 12-22 on the convenient reply card facing page 34.

Scarifier Scraper

The giant scarifier scraper is 5½ feet wide, and is equipped with six alloy steel teeth set on 12-inch centers. The teeth have a maximum penetration of six inches, are firmly locked in position when in use and can be raised or lowered from the tractor seat. The scarifier mounting bar has a high pivot which enables the dirt to roll freely in the box without clogging when the teeth are retracted. The front blade is attached to a 20-inch concave mold-board. The back plate (or blade)



is 20 inches wide and 66 inches long.

E. L. Caldwell & Sons, Inc., P.O. Box 2050, Corpus Christi, Texas.

Circle No. 12-23 on the convenient reply card facing page 34.

Ramp Trailer

The 6-ton Safeway ramp trailer is adjustable from 77" to 103" to fit the tracks of small crawlers and the dual wheels of rubber-tired tractors. Loader-backhoe combinations are also carried easily. This 4-wheel trailer, with brakes on all wheels, and self-blocking, fold-up ramps, cuts loading and unloading time to two minutes. Inside guide rails add safety to loading.

Triumph Machinery Co., Willow Grove St., Hackettstown, N.J.

Circle No. 12-24 on the convenient reply card facing page 34.





Compact Loader

A compact loader only nine feet long, including scoop, can turn around in its own length. Called the Bobcat, this machine has lift capacity of 1000 pounds and lift height of over 8 feet. Featuring a four-wheel drive, with the wheels on left and right sides operating independently of each other, the loader has outstanding traction. It has no transmission and no differential to wear out. Its variable speed direct drive is permanently lubricated and sealed against dust and other contamination.

Melrose Manufacturing Co., Gwinner, North Dakota.

Circle No. 12-25 on the convenient reply card facing page 34.

Winch Trencher

A compact utility trencher, the Davis W-36, is powered by a heavy-duty 6-hp engine and self-propelled by a six-speed winch drive. The unit trenches from 3-inches to 6-inches wide to a maximum depth of 36-inches and will operate at speeds up to 500 feet per hour. It has a built-in protective torque limiter that disengages when a shock load is encountered, then re-engages immediately to continue dig-



ging. By pulling a lever, a friction wheel engages the rear tire and the machine moves to a new trenching site or to its carrier at speeds up to 4.5 mph. The unit comes equipped with a complete staking kit—the main stake, a dead-man stake and guy line.

Davis Mfg. Inc., Wichita, Kans.

Circle No. 12-26 on the convenient reply card facing page 34.

Spray Hopper

A high volume hand hopper spray machine can be operated by one man using a high volume of low pressure air. The special Hopper holder with the machine lets one man refill the hopper without help. It is designed to spray anything that



flows by gravity through a $\frac{3}{8}$ " orifice and atomizes in low pressure air.

Goldblatt Tool Co., Kansas City 41, Missouri.

Circle No. 12-27 on the convenient reply card facing page 34.

Sandblaster

These sandblast machines are manufactured in three models with abrasive capacities of 100 lbs., 200 lbs. and 300 lbs. and designed for industrial use on all metal surfaces of bridges, fences, tanks and other machinery. Sandblasts are compact, light weight, and portable. Sand containers are formed of seamless drawn shells, giving maximum strength and minimum weight. They



are designed to operate with any dry granular material that will flow through the sieve.

P. K. Lindsay Co., Inc., 97 Tileston St., Everett, Mass.

Circle No. 12-28 on the convenient reply card facing page 34.

Material Spreaders

Hydraulic cab control of all components is featured on these spreaders. A movable, cab-controlled chute on both models, replaceable tail gate type and V-box type, drops the material onto the spinner in the position necessary to change the spread from left, to center or to the right of the truck. Spinner, augers and truck speed operate independently of each other to apply materials in wide or narrow swaths, from 2' to 45', and in heavy or light applications, as desired for ice control or resurfacing operations.

Swenson Spreader & Mfg. Co., Lindenwood, Ill.

Circle No. 12-29 on the convenient reply card facing page 34.



Power Sweeper



The Palmer Sweeper is towed by a pick-up truck or a light tractor. The 7-foot rotary broom is driven by a 9 horsepower gasoline engine. It is designed for smaller cities, airports, parking lots, factories and other areas where use of a large unit is not economically feasible. The sweeper has a standard 7-foot broom of fiber or steel bristles which operates at a speed of 165 rpm. It is

completely sealed with dust-proof bearings throughout. The only water needed is that used to wet down a fiber broom before starting; this is accomplished through a top hatch with a garden hose. The trash bin has a 1¼ yard capacity.

Palmer Engineering & Machinery, Inc., Lincoln, Nebraska.

Circle No. 12-30 on the convenient reply card facing page 34.

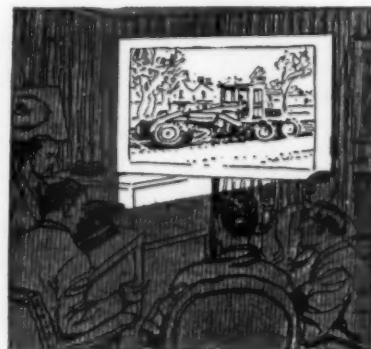
FILMS in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

"Suddenly Upon the Waters." Urges increased water pollution control and describes the need for followers of water recreational activities to cooperate. (27½ min., color, sound, 16 mm.) Produced for Outdoor Boating Club of America. Available from local office of Modern Talking Film Libraries.

"Auto, U. S. A." Discusses problems resulting from rapid growth of auto industry and suggestions for solution. (28 min., color, sound, 16 mm.) Produced under public service grant from the Perfect Circle Corporation. Available from Dynamic Films, Inc., 405 Park Ave., New York 22, N. Y.

"Soil Cement Stabilization." Construction of a soil-cement base course, using the P & H Single Pass Stabilizer. (30 min., color, sound, 16



mm.) Available from Harnischfeger Corporation, 4400 West National Ave., Milwaukee 46, Wisconsin.

"Crossing at Glen Canyon." Relates the story of bridging the great chasm 700 feet above the Colorado River and 1,028 feet in length. (27 min., color, sound, 16 mm.) Available from Department of Educational Services, American Institute of Steel Construction, Inc., 101 Park Ave., New York 17, N. Y.

"Reclaiming Land with Dynamite." Portrays how usable lands are quickly made productive by the use of dynamite. Laying out ditches and loading and shooting by propagation method are shown. (10 min., color, sound, 16 mm.) Available from Hercules Powder Company, Hercules Tower, 910 Market St., Wilmington 99, Delaware.

"The Grid Roller." Shows how the Grid roller turns pit run rock into highly-stabilized crushed rock base or surface courses—filmed on job sites of haul roads, highways and runways. (11 min., color, sound.) Available from Hyster Co., Tractor Equipment Division, 1008 N. Adams Street, Peoria, Illinois.

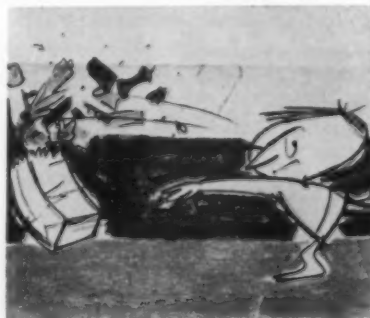
"George Spelvin, P. E." Produced to help develop professional concepts on the part of engineering students and graduates. Story centers around young design engineer and illustrates things which have brought him to professional status—ethics, education, registration, civic activities, broad personal interests. Available from National Society of Professional Engineers, 2029 K. Street, N.W., Washington 6, D. C.

"Challenge at Carquinez." The story of the design and construction of the first major shop-welded bridge now spanning Carquinez Strait in California. (27 min., sound, 16 mm.) Available from United States Steel Corporation, 71 Broadway, New York 6, New York.

"Winter Driving." Illustrates safe winter driving techniques for starting, stopping and cornering on snow or ice covered roads and demonstrates easy method for installing tire chains. (24 min., color, sound, 16 mm.) Produced in cooperation with the National Safety Council. Available from Bureau of Public Roads, Matomic Building, 1717 H Street, N.W., Washington 25, D. C.

"The SJ-50 Road Widener." Shows many locales and many different types of attachments available to do cement or asphalt widening and tamping-leveling widening. Available from Barber-Greene Company, Advertising Department, Aurora, Illinois.

"A Decent Burial." Produced to give sanitary and public health officials a tool for selling the benefits of sanitary landfill to their communities. Produced by and available



Scene from "A Decent Burial"

from Caterpillar Tractor Co., Peoria, Illinois. Also available from Washington and regional offices of U. S. Department of Health, Education and Welfare.

"The Case of the Curious Commissioner." An educational cartoon film strip on quality pavement design and maintenance for light-to-moderate duty roads at the county level. (18 min., sound tape or disc.) Available from The Asphalt Institute, Asphalt Institute Building, Campus, University of Maryland, College Park, Maryland.

"The Tellurometer System." Describing the principles of electronic distance measurement. (15 min., color, 16 mm.) Tellurometer, Inc., 206 Dupont Circle Building, Washington 6, D.C.

LETTER TO THE EDITOR

CONTROLLING MILLIPEDES: HELP WANTED

For several years Florence has been bothered by the annual appearance, during hot weather only, of what we have finally concluded to be (through the assistance of the Clemson College Extension Service) MILLIPEDES (Class Diplopoda); or as we commonly refer to them here, "thousand leggers" or "wire worms." These worms, in tremendous quantities, attack a well and filter system which is located 50' to 75 ft. from an abandoned city dump which is approximately 75 ft. to 100 ft. thick and 300 ft. in diameter.

In an effort to control them we have tried the following, but without success: 5 percent Chlorodane liquid and powder; 5 percent Malathion liquid and powder; 5 percent BHC dust + 5 percent DDT mixture; and ditching with poison.

We are now in the process of trying a poison bait with Paris Green and if this is not successful will try chloride of mercury.

We want to know what to do. We thought you might be in a position to help us since some other city or water utility may have faced a similar problem.

R. Powell Black
City Manager
Florence, S. C.

Editor's Note: We hope that our readers can help Mr. Black. Please write him, sending a copy of your letter to Public Works, Ridgewood, N. J.

CLASSIFIED ADVERTISING AND JOB OPPORTUNITIES

Natural Resources Coordinator

A Natural Resources Coordinator is wanted to organize, administer and coordinate county conservation programs. Salary \$831-\$1,038. Requires college graduation plus six years of either professional engineering experience or work in a conservation program involving considerable public contact. *Note:* At least 3 years of the experience must have been in an administrative, supervisory, or public relations function of a natural resources conservation program.

Apply immediately to:

Edward W. Firby
Director of Personnel
Room 101, Hall of Records
Fresno 21, Calif.

Business Administrator

Township of Berkeley Heights, New Jersey. Area, six square miles. Population 9,000, ultimate 16,000. Five years experience in municipal management required, with educational background in municipal government. Salary open and will be commensurate with experience and ability.

Please submit resume to:

Mr. William C. Russo
Town Clerk
29 Park Avenue
Berkeley Heights, N.J.

Sales Executive Available

A highly qualified marketing executive with a proven record in the public works and industrial equipment fields is seeking a challenging position. College graduate with A.B. in Business Administration plus 2½ years of Mechanical Engineering. 36 years of age. Currently Vice President of Sales for construction equipment firm. Resume on request.

Write to:

Box 12-G
PUBLIC WORKS Magazine
200 South Broad Street
Ridgewood, New Jersey

CIVIL ENGINEER

Completing MSCE January 1962. Third year EIT. Desire position as Assistant City Engineer or equivalent with Mid-Western town. Traffic and expressway design, and supervisory experience. Graduate work in Sanitary Engineering and Administration courses.

Reply to:

J. N. McGuire
1401 Pratt
Columbia, Missouri

Pavement Expansion Joint

An engineer and inventor has designed an unusual type of expansion joint of high efficiency and requiring no maintenance. He seeks an interested manufacturer to develop and market the design. For further information write to:

Box 12-1

Public Works Publications
200 South Broad Street
Ridgewood, New Jersey

WATER PLANT SUPT.

For City of Grand Forks, North Dakota. Population 35,000. Salary \$5,364-\$6,468, fringe benefits and pleasant working conditions. New plant, in operation three years. Age limits 30 to 55. Must be experienced in operation and maintenance of electrical and mechanical equipment and some experience with water plant equipment.

Apply to:

H. E. Martin
City Auditor
City Hall
Grand Forks, North Dakota

Assistant City Engineer

Assistant City Engineer is wanted by Meadville, Pennsylvania. Duties: Assist City Engineer in all phases of public works administration including sewage treatment, water supply, sanitary landfill operation, construction and repairs of streets and sewers, snow removal, building inspection, and city planning. Opportunity for varied experience and to become superintendent of Water Department and Sewage Treatment Plant in a clean, college town with a history of good government. Requirements: BS degree in Civil or Sanitary Engineering and some experience in related field. Salary: \$6,000-\$6,500.

Reply to:

City Engineer
City Hall
Meadville, Pa.

SANITARY ENGINEERS

Sanitary Engineers are wanted for design work on water and sewage treatment plants and related facilities. Must have 5 to 10 years experience. Salary based on qualifications and experience. Mid-western location.

Reply to:

Box 10-2
Public Works Magazine
200 South Broad Street
Ridgewood, New Jersey

SALES MANAGER

Experienced in Water & Sewage industry at consulting engineer level. Small established midwestern firm is expanding product line and improving manufacturer's agent sales force. Unusual opportunity for resourceful person to discuss this position on a confidential basis.

MANUFACTURER'S AGENT

Interested product line available to established agencies or to persons experienced in the Water & Sewage industry. Exclusive areas granted. Our entire interest is in this industry. Please reply stating accounts presently represented.

Write to:

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Alabama Pipe Company	1	Giedhill Road Machinery Co.	127	Pacific Flush Tank Co.	133
Allis-Chalmers	56	Goier, Inc.	114	Pelton Division	21
Amercoat Corporation	138	Gradall-Warner & Swasey Co.	45	Phelps Dodge Refining Corp.	42
American Bridge	147			Pittsburgh-Des Moines Steel Co.	10
Division of United States Steel				Pittsburgh Plate Glass Company	124
American Cast Iron Pipe Company	43	Hamilton Kent Mfg. Co.	6	Pomona Terra-Cotta Co.	14 & 15
American Steel & Wire	58 & 59	Healy-Ruff Company	131	Portland Cement Association	16 & 65
Division of United States Steel		Heil Company	135	Preload Company Inc.	131
Automatic Signal Division	35	Habbs Hyd-Pak	24	Public Works	127 & 150
Eastern Industries, Inc.		A Div. of Habbs Trailers			
Ayer-McCarel Clay Co., Inc.	14 & 15	Hepto-Warner & Swasey Company	45		
		Hough Company, Frank G.	66 & 67	Recordak Corporation	115
		Hydro E-Z Pack	152	Subsidiary of Eastman Kodak Co.	
		Division of Hercules Gallian Products, Inc.		Reilly Company, B. G.	130
				Republic Steel Corporation	70 & 71
Bowenston Shale Co.	14 & 15			Ridge Tool Company	18
Bucyrus-Erie Company	117	Industrial Paint Company	145	Roberts Filter Mfg. Co.	20
Buffalo Pipe & Foundry Corp.	144	Ingersoll-Rand	47	Rockwell-Standard Corporation	62
		International Harvester Co.	50, 51 & 72	Grating Division	
		Inveix Inc.	22 & 23		
				Schramm, Inc.	17
Canneton Sewer Pipe Co.	14 & 15	Johns-Manville	68	Simplex Valve & Meter Co.	60
Cast Iron Pipe Research Assoc.	8 & 9	Johnson Gear & Mfg. Co., Ltd.	150	Skinner Company, M. B.	39
Caterpillar Tractor Company	32 & 33			Smith & Loveless	61
Chase Manhattan Bank	35			Division-Union Tank Car Company	
Chicago Bridge & Iron Co.	Cover III	Kearney & Mattison Company	85 & 86	Synchro-Start Products, Inc.	44
Chicago Pump Company	3	Kerrigan Iron Works Company	69		
Clark Equipment Company	119	Keystone Plastics, Inc.	116	Tarrant Mfg. Company	48
Construction Machinery Div.		Koppers Company	143	Tennessee Coal & Iron Division	58 & 59
Classified Advertising	169	Tar Products Division		Texas Vitrified Pipe Co.	14 & 15
Clow & Sons, Inc., James B.	57			Tinker & Rasor	155
Columbia-Geneva Steel Division	58 & 59	Le Tourneau-Westinghouse Company	121	Trickling Filter Floor Institute	14 & 15
		A Subsidiary of Westinghouse Air Brake Co.		Trojan Mfg. Co.	48
		Link-Belt Company	149		
Darling Valve & Mfg. Co.	49			U. S. Pipe & Foundry Company	26 & 27
Deere, John	Cover II	McConaughay, K. E.	36 & 37	United States Steel Corp.	58, 59 & 147
Dempster Brothers	112	M & H Valve & Findings Co.	154	United States Steel Export Co.	58 & 59
Detectron	155	Martin Marietta Corporation	4		
Division of Tinker & Rasor		Concrete Products Division			
Detroit Stoker Company	127	Massaglia Metals	130	Vermeer Manufacturing Company	122
Dickey Clay Mfg. Co., W. S.	14 & 15	Miro-Flex Company, Inc.	46		
Dorr-Oliver Inc.	25	Monarch Road Machinery Co.	44	Walker Process Equipment Inc.	134
Drott Manufacturing Corp.	50 & 51	Morton Salt Company	123	Wallace & Tiernan Co., Inc.	Cover IV
		Industrial Division		Warn Mfg. Co., Inc.	40
		Mueller Co.	11 & 19	Warner & Swasey Co.-Hepto.	45
Earthworm Boring Machine, Inc.	155	Multiplex Manufacturing Co.	54	Westinghouse Electric Corp.	28 to 31
Enterprise Engines	129			Willis Motors, Inc.	41
Power Div. of General Metals Corp.		Natco Corp.	14 & 15	Wood Company, R. D.	141
		Neptune Meter Company	63	Woodward Iron Company	13
		Nichols Engineering & Research Corp.	122	Wyandotte Chemicals Corp.	38
Fitchburg Engineering Corp.	12			Michigan Alkali Division	
Flexible Inc.	136	O'Brien Manufacturing Corp.	139		
Flynn & Emrich	137				
Ford Meter Box Company, Inc.	142				
Ford Meter Company	52 & 53				
Forney Inc.	172				
Fox River Tractor Co.	120				
Frank Sno-Plows, Inc.	64				

DIRECTORY OF CONSULTING ENGINEERS APPEAR ON PAGES 156 to 161

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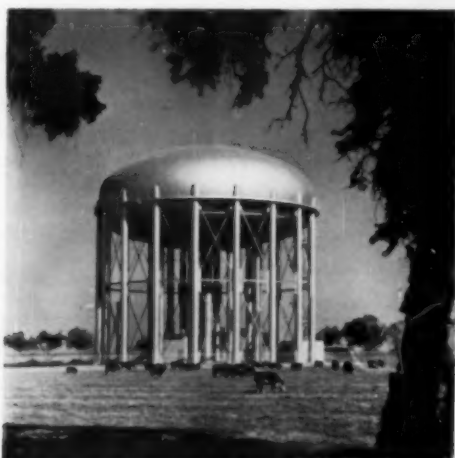
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WORTH

SEEING

America's most scenic highway, Interstate 95 from Augusta to Fairfield, Maine, was chosen from 300 entries in the "scenic highway" contest sponsored by Parade Magazine. The judges cited the Maine highway as the best example of a "driver's road," combining scenery, speed and safety. This view, just north of Augusta, shows how the road was designed into the landscape by engineers of the State Highway Commission, taking advantage of natural beauty.



This giant Horton Spheroidal with a three million gallon capacity is one of the two largest elevated steel tanks for water storage in the nation. It was designed and built by Chicago Bridge & Iron Company for the City of Sacramento, California. A CB&I tank of equal capacity is serving Portland, Oregon.



D. Grant Mickle, new deputy federal highway administrator (right), is sworn in by Commerce Secretary Luther Hodges. Mickle, well-known as an authority on urban transportation, is expected to concentrate on urban highway and traffic problems related to the multi-billion-dollar National Highway Program.



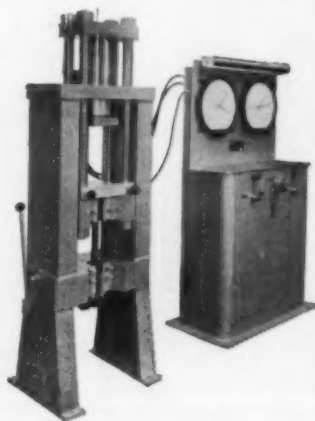
Following Hurricane Carla, two Hobbs Hyd-Pak refuse collection trailers were loaned by the manufacturer to assist in clearing debris left in the wake of the storm. One unit carried 6,000 pounds of clothing, supplied by the Salvation Army, to the distressed area. Shown here is a trailer unit on the job in the Houston area as it takes on a load of debris for compaction and removal in its 42-cubic yard body.



KNOWN THE WORLD OVER

MODEL LT-800 UNIVERSAL TESTER

Designed especially
for the Construction
Materials Laboratory



Capacity 0—250,000 lbs.
Standard Equipment includes:

- Gripper Blocks for Nos. 2 through 11 Reinforcing Bars
- Upper and Lower Platens for 6" x 12" Cylinders
- Automatic Safety Switch
- Power Control for Precise Adjustment of Rate of Loading

Extra Apparatus for Testing:

- Concrete Masonry Units
- Beams 6" x 6"
- Cubes 2" x 2" and 6" x 6"
- Bricks
- Weld Specimens in Bend and Tension

Model LT-800 is only one of a complete line of low-cost, top quality machines made and guaranteed by . . .

FORNEY'S, INC.

Tester Division
P. O. Box 310
New Castle, Pa., U. S. A.
Phone OLiver 2-6611
Cable: Forney's, New Castle



by Arthur K. Akers

★ Our best Christmas wishes are extended to all our readers. And these wishes carry on into the New Year, that it may be a happy and prosperous one for all of you.



The Plaque

Federation meeting in Milwaukee in October. As in this case, it will be presented in the future only to those making exceptional contributions to the water pollution control field.

★ **William O. Boschen** has purchased controlling interest in the Ralph B. Carter Co., manufacturers of sewage treatment equipment, and will assume its presidency.

★ **Saul Riehlman** appointed assistant sales manager, Simplex Valve & Meter Co. Division, Pfaudler Permutit Inc., Lancaster, Pa.

★ **G. E. Nicholson** elected president of Magee-Hale Park-O-Meter Co., Oklahoma City, succeeding **G. A. Hale**, now chairman of the board. **Robert J. Geis** becomes executive vice-president.

★ The Foxboro Company announces **Earle W. Pitt** as western field sales manager, with **Earl M. Kelly** to be Cleveland regional manager and **Steve V. Kerstner** Los Angeles branch manager.

★ Purchases in this field last month include: That of M. & H. Valve and Fittings Co. by Dresser Industries, from the Walworth Co. . . . the crawler tractor business of Cletrac Corp. by Oliver Corp. subsidiary of The White Motor Co. . . . U. S. Pipe and Foundry Co., Birmingham, acquires soil pipe manufacturing plants of Combustion Engineering Co. in Chattanooga and T. C. King Pipe & Foundry Co., Anniston, Ala.

★ U. S. Pipe & Foundry also announce four additional new sales offices, in Atlanta, Memphis, Lansing, Mich., and Fresno, Calif.

★ **M. E. Carroll** advances from executive vice-president to president, Clinton Engines Corp.

★ **H. D. Weller** appointed to newly created position of vice-president, director of marketing for The White Motor Co. trucks. A new South-eastern sales region has also been created, at Charlotte, N. C. under **B. S. Lucas**, vice-president.

★ **L. B. Foster Co.**, steel pipe suppliers, names **D. M. Middleton** manager of its Cleveland operations; **George Francis** is upped to district manager, Foster's Minneapolis operations.



Mr. Firstenberger

★ **Lowell W. Firstenberger**, president of Fiese and Firstenberger Mfg. Inc., Fresno, Calif., maker of vertical turbine pumps, was elected president of the Vertical

Turbine Pump Association at the organization's annual meeting in Kansas City in September. The term is for one year. The next meeting will be in Las Vegas in February.

★ **Bernard M. Busch** now general manager, Grating Division, Rockwell-Standard Corp., Gary, Ind. succeeding **F. K. Smith**, promoted to Air-Maze Div., Cleveland.

★ **Jack Engle** appointed sales promotion manager, Le Roi Division, Westinghouse Air Brake Co.

★ **Wayne Mfg. Co.**, Pomona, Calif., elects **Gil M. Wayne**, president, succeeding **Charles M. Weinberg**, founder of the firm, deceased.

★ Wife to husband: "What's worrying you, dear?" Husband: "Well I have a dollar left over this week and I can't remember what installment I forgot to pay."

Nation's Largest Stores 3,000,000 Gallons



CB-6126

CB&I built it of steel

The cities of Sacramento, Calif., and Portland, Ore., needed substantially larger water storage facilities. Both cities selected giant 3,000,000-gallon CB&I Horton Spheroidal steel tanks, the nation's largest elevated water storage units.

During extended hot spells, Sacramento's daily use often rises to 500 gallons per capita. This seemingly insatiable demand for water is stimulated by a unique city char-

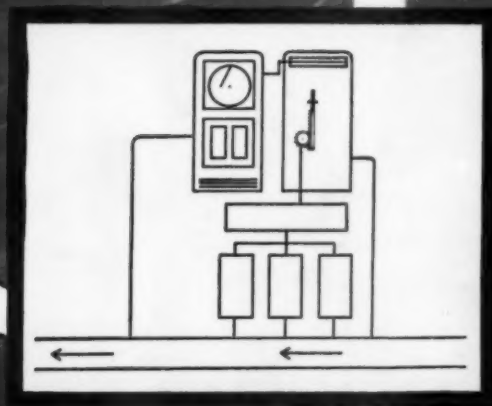
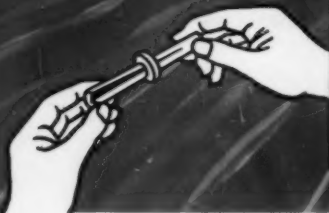
ter which provides unmetered water for the local citizenry. The monthly water bill for a six room home is a low \$2.75!

This situation calls for a highly efficient water system. The new, giant 3,000,000-gallon CB&I Horton Spheroidal steel tank, in every respect, contributes measurably to this requirement—in original investment and in operating and maintenance costs.

CB&I's long experience in designing every conceivable type of steel water storage can be of invaluable help in developing the most efficient water storage facility for you. Bulletin A-30 shows the various ways CB&I can help. Write for it today! Chicago Bridge & Iron Company, 332 S. Michigan Avenue, Chicago 4, Illinois. Offices and subsidiaries throughout the world.

This 3,000,000-gallon CB&I Horton Spheroidal elevated tank is 126 feet in diameter. Head range is 35 feet, height to bottom 77 feet. The tank is supported by 18 outer and 9 inner columns designed to withstand a 6% seismic force.

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